

LITHIC TECHNOLOGICAL AND FUNCTIONAL VARIABILITY
BETWEEN MESA AND RIVERINE ENVIRONMENTS
IN THE MID-COLUMBIA RIVER BASIN

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ABSTRACT

LITHIC TECHNOLOGICAL AND FUNCTIONAL VARIABILITY BETWEEN MESA AND RIVERINE ENVIRONMENTS IN THE MID-COLUMBIA RIVER BASIN

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This study develops a theoretically informed method and technique to compare variability between pre-contact riverine and hinterland Mesa archaeological resources of the mid-Columbian River Basin in Central Washington. To test the developed model, the study follows suggestions made by Dr. William Smith (1977:82) to “develop a testable hypothesis” using Mesa sites and other site types across environments with a more “sophisticated system for the classification of both artifacts and features.” Three sites (Mesa 06, 12, and 36) are compared to a riverine site (45DO673) to determine how the frequency of technological and functional traits of lithic stone tools and debitage vary. Features of the three above mentioned Mesa site are discussed and detailed in Smith (1977:68-74) and not included in this study. Results are evaluated based on stone tool expectations derived from Plateau pre-contact land use models. Significant technological and functional differences are present within Mesa sites, between Mesa sites, and between the three hinterland and one riverine occupation site (45DO673). Functional differences were found between the Bottom and Top of Mesa 12 while technological differences were not. Specifically, Mesa 36 likely had a wider array of reduction activities than Mesa 12 and 36 based on flake completeness, stone tool frequencies, and

stone tool evenness. Adjacent interbedded stone tool sources possibly led to differing selective conditions at Mesa 36 than Mesa 12 and Mesa 06. Based on stone tool data, selective conditions likely varied between the Top of Mesa 12 and Bottom.

All three Mesa sites differed across technological and functional categories when compared to 45DO673. A portion of that variability appears driven by differences in tool stone raw material availability. The lithic expectations developed from the Sanpoil-Nespelem and Dunnell and Dancey (1983) models did not uniformly apply to relationships between the Mesa sites or between 45DO673 and the Mesa sites.

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CHAPTER I

INTRODUCTION

The Central Columbia River Basin was subject to extensive archaeological study during the latter half of the twentieth century; however, much of that work has focused on the Columbia River corridor and its tributaries (Lyman 2002). While numerous archaeological resources were recorded in hinterland environments, excavations have been limited (Dancey 1973; Lohse and Sprague 1998; Lyman 2002). Of the limited hinterland excavations, the Mesa sites of Central Washington (Smith 1977) are the most geographically unique. The Mesa site type has been defined by evidence of pre-contact occupation on basalt mesa formations often composed of exposed upper colonnade and entablature that were left behind following ice-age Missoula flood waters (Bjornstad 2008). This definition as a site class (with minor variation) is common across archaeological literature (Chatters 2004; Fitzpatrick 2018; Galm 2006; Harrod and Tyler 2016; Kuntz 2009; Lothson 1989; Miss 1997; Smith 1977; Washington 1973). This definition as a site class, while useful as an organizational tool, has led to the treatment of Mesa sites as a single group and dataset (Harrod and Tyler 2016; Reid 2014) despite the individual and multi-functional site assemblages shown in archaeological research (Galm 2006; Kuntz 2009; Smith 1977). All Mesa sites included in this study have occupation evidence ranging from stacked rock features to broad assemblages containing hearth and house pit features with bone and lithic assemblages (Washington 1973:3). Sites without stacked rock features or not fitting the geomorphic description above are not considered in this study. Ethnographic and archaeological evidence gathered in the twentieth century indicate that Mesa sites were occupied by pre-contact peoples during the late

archaic period into the proto-historic (2500- Before Present [BP]-Contact) (Smith 1977:67).

Smith's (1977) work examined both above and below surface features and intact archaeological deposits to determine the age of four Mesa sites while contributing to the discussion of site function. These excavations recovered occupational evidence of upland Mesa landforms consisting of house pits, hearths, rock features, faunal remains, and large lithic assemblages. Occupation was dated between 2000-300 BP based on bulk radiocarbon analysis at three sites: Mesa 06, 12, and 36 (Smith 1977:67). Besides the initial robust inventory and description of artifact content produced by Smith (1977), many questions about the nature of these assemblages remain unanswered. Based upon examination of initial findings by Smith (1977) a comparison of lithic technological and functional variability with other Mesa sites and sites in alternative environmental contexts is the best way to further address Mesa site variability. Additionally, a comparison of lithic frequencies to lithic based expectations from previously developed Columbia Plateau settlement models will aid in addressing questions of Mesa site technology and function.

Several other Mesa sites have been the target of archaeological excavation, most of which have yet to be examined using systematic technological and functional classifications to examine lithic variability (Galm 2006; Kuntz 2009; Miss 1997; Osborne 1967; Swanson 1962). These studies have provided valuable data towards understanding the role of Mesa site use in late pre-contact Columbia Plateau archaeology (Chatters 1998). Without the research questions posed by Osborne (1967), Washington (1973),

Smith (1977) and Galm (2006) an in-depth material specific analysis would lack a meaningful context for these unique sites.

Problem

While previous Mesa site studies contribute to knowledge of Mesa site function over the last two thousand years, few have followed suggestions made by Smith (1977:82) to “develop a testable hypothesis” using Mesa sites and other site types across environments with a more “sophisticated system for the classification of both artifacts and features.” Previous studies have focused on stone feature interpretation (Smith 1977:68-74), broad site comparisons (Lothson 1989), faunal analysis (Fitzpatrick 2018), or limited ethnographic evidence and comparison to southwestern cultures (Osborne 1967; Washington 1973). The most current studies of Columbia Plateau Mesa lithic assemblages have been single site investigations (Galm 2006; Kuntz 2009).

Contemporary studies (Chatters 2004; Harrod and Tyler 2016:233; Reid 2014:169) often treat the Mesa sites as single analytical units, assigning one or more of the most often cited functions for the occupation, such as defensive refuges, seasonally occupied hunting camps, or non-game forager outposts, and generally treating all Mesa sites as the same type. These studies have used the rock features and defensibility of Mesa sites as evidence that defense was their main function, without performing a more sophisticated artifact analysis as suggested by Smith (1977:82). Three of the four Mesa sites excavated by Smith (1977:64) (Mesas 06, 12, and 36) have extensive lithic tool and debitage assemblages. Testing for a defensive lithic assemblage was not the goal of this study. However, a Mesa site and riverine occupation site model with which to consistently compare lithic technology and function between the Mesa sites themselves as well as

other site types has not been proposed. Therefore, this study must first develop a model before a comparison can be completed. A study of lithic technological and functional variability between the Mesa sites and an occupation site in a riverine environment would allow researchers to compare technological variability through lithic debitage and functional variability through stone tool frequencies.

Riverine occupation sites used during the last 2500 years have been interpreted to represent a wide range of activity types based on archaeological data sets including diverse lithic assemblages (Chatters 1984). In contrast, based on previously proposed models, the Mesa sites should have less lithic diversity, be task specific assemblages, and have low lithic assemblage variability (Dancey 1973; Galm 2006; Ray 1932). If Mesa sites' lithic assemblages have lower diversity than riverine occupation sites, then the proposed task specific functions assigned through previous research (Galm 2006; Lothson 1989; Miss 1997; Washington 1973) are more credible. Alternatively, the Mesa sites may each present a unique or truncated (Dancey 1973) stone tool assemblage. Assessing if the occupants of Mesa sites 06, 12, and 36 were acted upon by the same environmental constraints (e.g., raw material availability, characteristics) as a riverine site (45DO673) and evaluating the diversity of lithic assemblages between the two site types will determine how Mesa site lithic assemblages align or do not align with previously constructed models of pre-contact Columbia Plateau land use.

Purpose

The purpose of this study is to develop and test an approach that will determine whether lithic technological and functional characteristics are consistent with past interpretations of Mesa site function. This will be accomplished by first developing the

research question: how does the frequency of technological and functional traits of lithic stone tools and debitage vary between the microenvironments (immediate small-scale environment) of a riverine occupation site and hinterland Mesa occupation sites? The variability or lack thereof will be tested with the null hypothesis: there is no significant variation in lithic technology and function between one riverine and three hinterland Mesa sites. The results are then discussed considering expectations based on previously established mid-Columbia Plateau models.

An evolutionary archaeological approach is best used to interpret technological and functional variability between lithic assemblages because the variation in the archaeological record is the subject of study (O'Brien and Lyman 2000). Evolutionary archaeology theory acknowledges that humans are subject to selection. There are two mechanisms by which nonrandom sorting is explained in the archaeological record: cultural transmission and natural selection (Dunnell 1978a, 1980; O'Brien and Lyman 2000). The first step in an evolutionary archaeology approach is to determine if post-depositional sources of sorting (e.g., bioturbation, recovery, sample size, etc.) have yielded biased samples so that we do not mistakenly attribute those sources to stone tool manufacture and use (O'Brien and Lyman 2000). As part of using an evolutionary theoretical framework for this study, the sources of nonrandom variation (field methods, sampling, etc.) will be acknowledged so that the remaining variation may be linked to changes in the frequency of technological and functional traits between microenvironments. After these factors are taken into consideration, an evolutionary archaeological approach can determine if past human behavior observed through

nonrandom frequencies is reflective of the specific selective conditions under which people made and used stone tools (Dunnell 1989; Parfitt and McCutcheon 2017).

Constructing a model to compare lithic frequencies between Mesa sites will permit an evaluation with other site types to determine if those frequencies are consistent with previous interpretations. The following objectives first build a model to answer questions about differences in lithic artifact frequencies across archaeological assemblages. That model will then be used to interpret the results of a comparison between three hinterland Mesa sites and a riverine site. The collection rehabilitation, analysis, and hypothesis testing are completed through four objectives:

- 1) The Mesa 06, 12, and 36 collections were excavated from 1973 through 1975 and artifacts were processed primarily in the field with later laboratory analysis. Over the past 46 years the collections were moved and partially separated from the original provenience information gathered by Smith (1977). All artifacts were re-cataloged using current techniques and provenience was recovered for 98% of the collection due to the thoroughness of original cataloging efforts.
- 2) Objective two was to construct or adapt a lithic technological and functional model with select variables that measure variation in stone tool manufacture and use. This model was used to develop a method and technique that facilitated assessing variability between Mesa hinterland and riverine occupation sites. Measurement of variables that relate to stone tool cost and performance permit identifying whether the selective conditions (environmental constraints) under which people used and made stone tools

differed significantly between riverine and hinterland occupations (Ferry 2015; Lewis 2015; McCutcheon 1997; Parfitt and McCutcheon 2017; Senn 2007; Vaughn 2010).

- 3) To use the developed model, a mass analysis of lithic debitage and tools from Mesas 06, 12, and 36 was conducted to record basic attributes and their variability within each Mesa site. Flakes were first sorted by size classes and then by simplified diagnostic properties (Debris, Fragment, Broken, and Complete) outlined by Sullivan and Rosen (1985). One hundred percent mass analysis (flake size and completeness) of Mesa site debitage was completed. All stone tools from each site was assigned to mutually exclusive categories based on technological attributes. A functional analysis of stone tool types (projectile points, bifaces, utilized flake tools, ground stone, and cores) was compared against the results of mass debitage analysis. To assure that the lithic frequencies was representative, a bootstrapping program was used to generate resampling curves (Lipo et al. 1997; McCutcheon 1997). The data was collected through attribute analysis of the excavated assemblage to test the null hypothesis: there is no significant variation in lithic technology and function between one riverine and three hinterland Mesa sites.
- 4) Following acceptance or rejection of the null hypothesis the research question is addressed: how does the frequency of technological and functional traits of lithic stone tools and debitage vary between the microenvironments of a riverine occupation site and hinterland Mesa occupation sites? The results are

then compared against previous settlement and subsistence models for the Mid-Columbia Plateau and Mesa sites.

Significance

The significance of this study stems from the conflicting archaeological and ethnographically based explanations of Mesa site function (Lothson 1989; Osborne 1967; Smith 1977:75-76; Washington 1973). Recent work by Galm (2006) and Kuntz (2009) were purposefully designed as broad studies encompassing entire site assemblages and lack detailed analysis that differentiates function and technology in the archaeological record. Furthermore, contemporary publications are still interpreting the archaeological record from Smith's original 1970s Mesa project investigation without any additional analysis (Chatters 2004; Harrod and Tyler 2016; Reid 2014). This kind of interpretation is problematic as it ignores Smith's (1977:82) call for a "Full understanding of the significance of the mesas themselves ultimately will require investigation of non-mesa sites, particularly those located in the Channeled Scablands of the Columbia Basin". While Smith's (1977:82) work was pioneering towards defining prehistoric Mesa function, he also recommended a more "sophisticated" artifact analysis. Smith's (1977:68-69) report is primarily based on interpretation of features and provides a brief discussion of artifacts. A more intensive assemblage analysis, partially completed through faunal analysis of Mesa 12 (Fitzpatrick 2018), will expand on Smith's (1977) initial interpretations. Continuing Smith's work and comparing the results of a detailed Mesa lithic analysis to an analysis of a riverine lithic assemblage can identify differences in the selective conditions present in the past site environments.

The role of Mesa sites in late pre-contact land use is poorly understood and the current proposed models for their use are based on limited archaeological evidence (Chatters 2004; Smith 1977). A material specific lithic analysis is the first step towards understanding pre-contact hinterland Mesa land use due to the high frequency of lithic artifacts and their ability to directly answer site function research questions. Furthermore, only a single previous study has completed material specific analysis in an attempt to define Mesa site function or Mesa site relationships to other Plateau site types (Fitzpatrick 2018). In order to follow suggestions made by Smith (1977:81-82), I will generate material specific archaeological data that can be used to further compare Mesa sites to site types in different environments.

The following thesis consists of six additional chapters: Study Area (Chapter II), Literature Review (Chapter II), Methods and Techniques (Chapter IV), Results (Chapter V), Discussion (Chapter VI), and Conclusions (Chapter VII). The study area and literature review chapters build an environmental, cultural, and archaeological context for the current study. The results chapter presents lithic analytical and radiocarbon chronological data while Chapter VI discusses the results in context of past Plateau and Mesa settlement and subsistence models. Chapter VII provides a summary, overall conclusions of the study, and recommendations for future research.

CHAPTER II

STUDY AREA

Location

The Mesa sites that are the focus of this study are located in Township 23 North Range 26 East and Township 23 North, Range 28 East as depicted on the *Little Soap Lake* and *Wilson Creek Northwest* United States Geological Survey (USGS) 1:24,000 topographic quadrangles (USGS 1956, 1986) (Figure 1). The primary comparative riverine site (45DO673) is in Township 20 North, Range 22 East as shown on the *West Bar* USGS 1:24,000 topographic quadrangle.

Physical Setting

Situated between the Cascade Ranges to the west and the Rocky Mountains to the east, the Columbia River Basin is an arid landscape (receiving less than 30 centimeters of precipitation per year). Glacial flooding is partially responsible for the barren nature of central and eastern Washington. Towards the end of the last ice age (approximately 12,000 years ago) the massive glacial ice dams blocking the Clark Fork River in northern Idaho broke many times over a series of 2,500 years (Bjornstad 2008). This massive outflow of water flooded through Idaho and Washington, creating the Channeled Scablands that represent the present-day landscape near the Mesa sites. These floods carved enormous channels into the Miocene age basalt flows, creating basins and canyons, some of which still retain water (USGS 2006). The nearest natural bodies of water to the project areas are Lake Lenore (Mesa 06), Williams Lake (Mesa 12), and the Columbia River (45DO673).

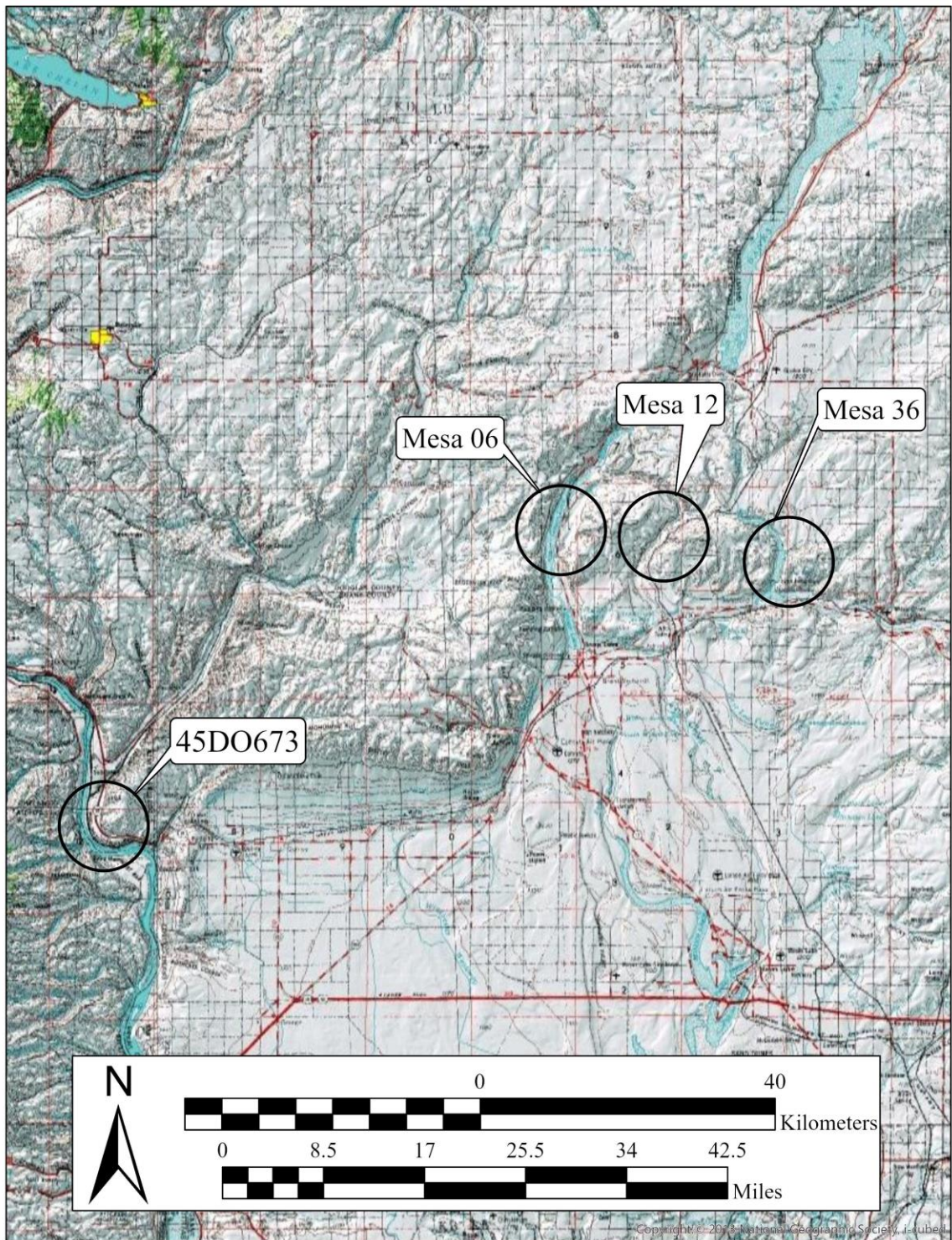


Figure 1. USGS Project Vicinity Map.

Located in a basin canyon of the Grand Coulee, Lenore and Williams lakes are remnants of flooding events and alkali lakes (USGS 2006). Mesa 36 is adjacent to Billy Clap Lake, a man-made reservoir constructed as part of the Columbia Basin Irrigation Project in 1948 (United States Bureau of Reclamation 2018).

The geology of the physical mesa formations consists of metamorphic and granitic Pleistocene gravels deposited as outwash from the Okanogan and Cordilleran Ice sheets during the Spokane glacial floods. The gravels rest on the remains of the mid-Miocene (15-15.5 million years ago) Grand Ronde basalts or the slightly younger Wanapum basalts (Figure 2) (Gulick 1990:5; USGS 1991). Diatomaceous earth, sandstone, mudstone, and sedimentary deposits containing petrified wood and bog are often found interbedded between the basalt flows as part of the Ellensburg Formation (Gulick 1990; Vaughn and McCutcheon 2011). The Ellensburg Formation was the most common local tool stone source used by Native American groups in the study area (Chatters 1998:31).

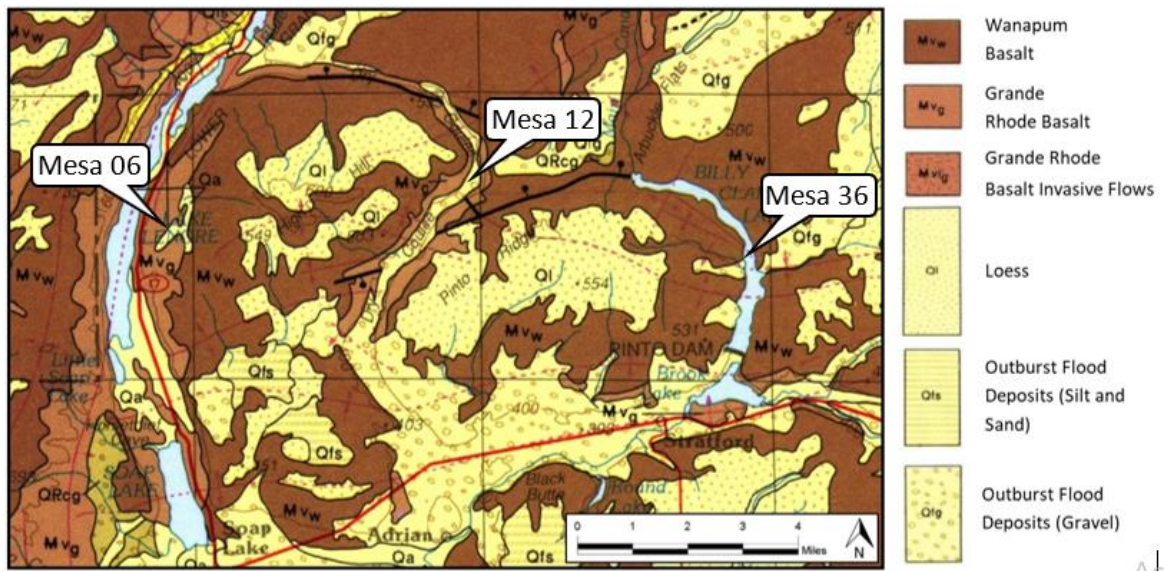


Figure 2. 1:250,000 Geological Map of Study Area (adapted from USGS 1991:1).

Where soils occur on top of the mesa formations, they typically consist of silty loam alluvium with a depth of up to two meters (United States Department of Agriculture [USDA] 2017). However, the archaeological investigations completed at four Mesa sites suggest that soil deposition is as little as 25 cm on these specific landforms (Smith 1977:41-42). Based on a review of Smith (1977), soil deposition appears to have guided excavation locations during the Mesa Project. Soil in which to excavate is often limited on the mesa tops due to aeolian deposited silt.

Riverine Geology and Soils

Site 45DO673 is situated on the eastern bank of the Columbia River, partially inundated by Wanapum Lake. Soils at 45DO673 consist of Torriorthents fine sandy loam with a rounded cobble/pebble layer 30 cm below surface formed from the parent glacial outwash material (USDA 2017). The geology directly at the site location is composed of Rocky Point Basalts primarily consisting of fragmented pillow flows 10 to 15 meters thick with intermixed sand (Figure 3). Unlike the flows at the Mesa sites, the Rocky Point basalts are unbedded (Tabor et al. 1982).

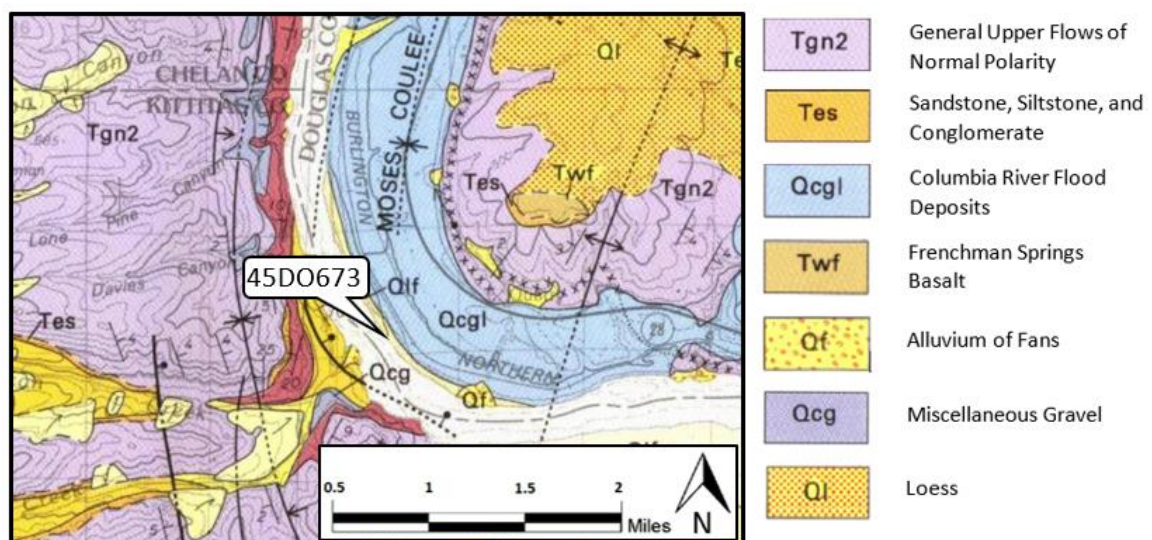


Figure 3. 1:100,000 Geological Map of 45DO673 (adapted from Tabor et al. 1982:1).

Columbia Plateau Interbeds

Chert tool stone is ubiquitous with pre-contact archaeology on the Columbia Plateau and is often the predominant tool stone in lithic assemblages (Ames et al. 1998). Its common occurrence and frequent use by pre-contact peoples is likely due to its high availability as an interbedded sedimentary layer in the Columbia River Basalt groups. Specifically, these layers occur as part of pillow-palagonite complexes where a lava flow has encapsulated organic material such as bogs, petrified wood, or organic soils (Miller and Powell 1997). These sedimentary layers are collectively termed the Ellensburg Formation, which is exposed as a result of weathering and uplift across the Columbia Plateau (Reidel 1984). Many of these features act as aquifers with small springs that not only attract animals, plants, and people for water, but also double as sources of tool stone. Springs are so commonly associated with sedimentary tool stone bearing layers that Miller and Powell (1997) recommend following lines of springs on topographic maps to predict interbed locations. In addition, geologic maps often note the presence of interbeds between particular flows. Tracing the contacts of these flows can aid in predicting raw material source locations.

Figure 4 depicts predicted locations of raw material sources of Mesas 06, 12, and 36 based on contacts between the Frenchman Springs, Priest Rapids, and Roza members of the Wanapum Basalt group (Gulick et al. 1990; Vaughn and McCutcheon 2011). The contacts between Frenchman Springs flows and Roza or undifferentiated basalts are most common within a mile of all three Mesa sites. The Frenchman Springs flow in this region is known to have petrified wood deposits at the base (Grolier and Bingham 1971).

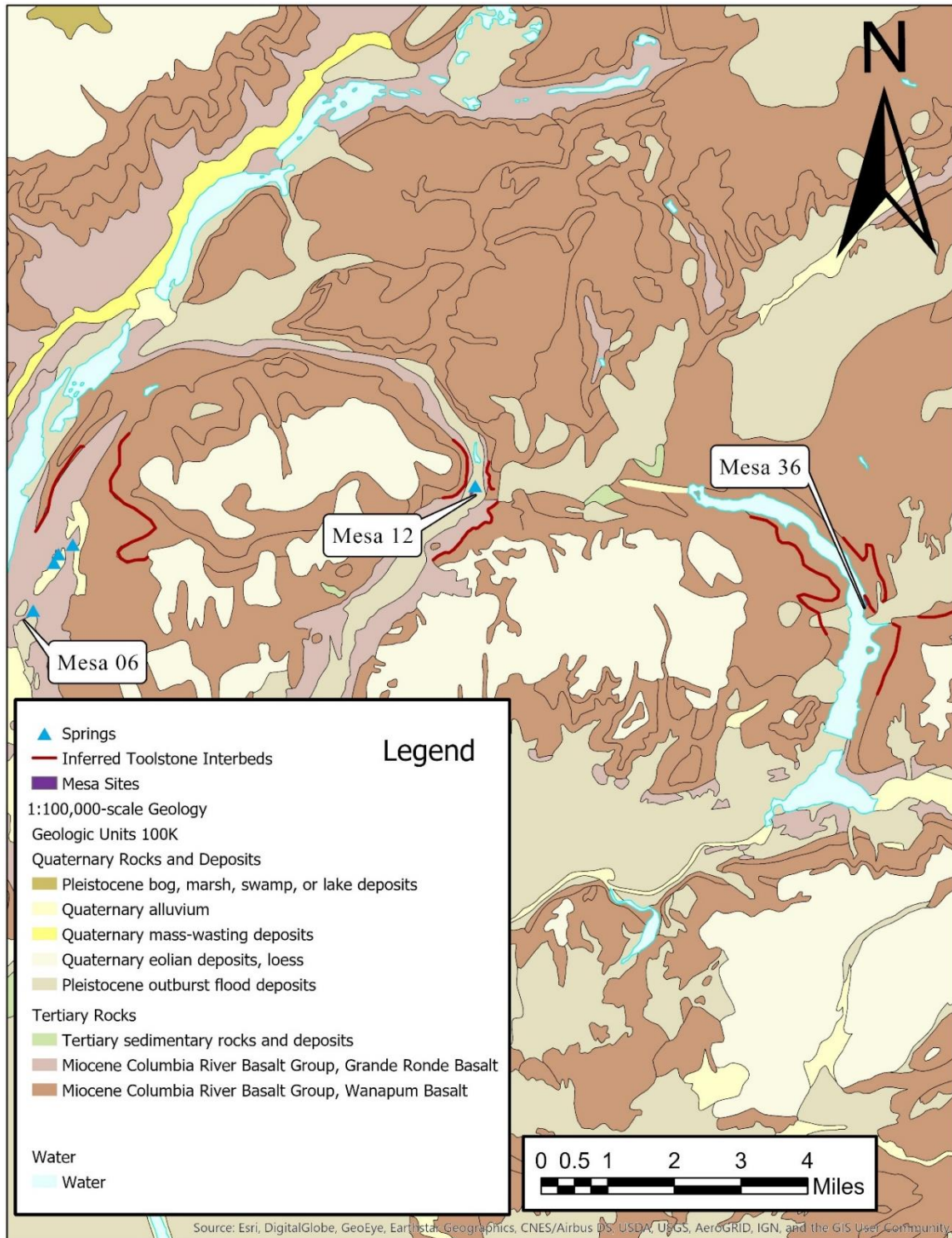


Figure 4. Mesa Site Potential Interbed Locations

Paleoenvironment

Although it is important to identify the modern or ethnographic physical environment, the Pacific Northwest has changed greatly since the first humans arrived around 14,000 BP (Chatters 1998:73; Davis et al. 2019:2). Due to the lack of lake core data in the immediate region, the following description relies on the nearest available synthesis of Pacific Northwest paleoclimate (Fulkerson 2012; Walsh et al. 2015). The lithic assemblages examined for this study come from components that are dated to the middle to late Holocene (Root et al. 2016; Smith 1977:67). Therefore, the early Holocene paleoclimatic data will be omitted and can be reviewed in the references cited above.

During the middle to late Holocene (~6800 BP) temperatures shift to modern equivalents, and the sagebrush-steppe ecoregion present today is well established by 4000 BP (Brunelle et al. 2005). Summers are slightly wetter/cooler in general, but winter temperatures are within modern ranges (Brunelle et al. 2005). Climate was relatively stable over the last 4000 years compared to the middle and early Holocene (Walsh et al. 2015).

Cultural Setting

While human occupation of the Columbia Plateau spans more than 14,000 years BP this study concentrates on Frenchman Springs Phase through the Cayuse and Contact periods as the sites subject to study and comparison were occupied during these sequences (Galm et al. 1981). The descriptions of sequences in Table 1 concentrate on changes in lithic tool industries through time and describe land use pattern changes where

relevant. The changes in phase originally proposed by Nelson (1969) and Leonhardy and Rice (1970) are largely based on shifts in projectile point technology and additions and/or subtractions from lithic tool types.

Table 1. Changes in Lithic Technology Between Cultural Historical Sequences

Phase	Years BP ^a	Description
Frenchman Springs Phase (Chatters 1984)	4500-2500	<ul style="list-style-type: none"> • Resource Intensification • Use of Local Tool Stone • More Expedient • Less diversity than Cayuse Phase • More cobble and ground stone tools • Decrease in projectile point frequencies
Cayuse Phase (Leonhardy and Rice 1970)	2500-250	<ul style="list-style-type: none"> • Projectile point forms are frequently small corner or basal notched arrow points • Further increase in lithic tool diversity • More non-local tool stone large cobble chopping tools are frequently recorded along with formed scrapers

^a Date ranges are based on a combination of un-calibrated bulk soil and shell radiocarbon dates

Specific to the occupation of the Mesa sites, the Cayuse Phase (2500 BP-Contact) shares similarities across the Plateau and generally is considered to share traits with ethnographically recorded cultures of the early twentieth century (Smith 1977:67). Nearly all major waterways, as well as all landform types across the Columbia Plateau, are known to have been occupied during the last two thousand years. Increased trade and movement in the Cayuse Phase, as depicted through increasing examples of exotic shell and obsidian, has been thoroughly documented in the archaeological assemblages of the Columbia Plateau (Andrefsky 2005b). An increase in population during this period coincides with the amount of pit house villages located in riverine environments (Andrefsky 2005b). Lithic material culture is best represented by the emergence of the bow and arrow and a variety of stemmed and corner notched points associated with smaller projectiles (Chatters 2004). Occupation of the Mesa sites, based on radiocarbon

dating, did not occur until roughly 2,500-300 BP (Galm 2006:4.23; Miss 1997; Smith 1977:67). The Mesa sites selected for study represent the known chronological extent of pre-contact occupation on mesa landforms in the Columbia Plateau. The original dates given by Smith (1977:67) are based on un-calibrated bulk charcoal samples in radiocarbon years before present. Based on these samples, Mesa 06 was occupied between 220-615 BP, Mesa 36 between 945-1015 BP, and Mesa 12 between 110 and 2700 BP (Smith 1977:67).

Ethnographic Setting

Concentrated ethnographic research on the interior Plateau developed from work by the United States Bureau of American Ethnology in the late nineteenth century. Work in the Columbia Plateau began under the direction of Franz Boas as part of the Jesup North Pacific Expedition from 1897 to 1900 (Ames 1991). James Teit, a Scottish born researcher who was previously familiar with the Salish tribes of British Columbia, produced the first overview of the Middle Columbia River peoples in 1928 based on fieldwork conducted between 1900 and 1910 (Lohse and Sprague 1998; Teit 1928). Verne Ray (1932) working with the Bureau of American Ethnology through the University of Washington gathered the most-often cited primary data on the Sanpoil and Nespelem peoples of the mid-Columbia region.

Prior to Euro-American contact, the project area was used by numerous groups across the Columbia Plateau. All sites discussed in this thesis are on the ceded lands of the Yakama Nation, where the tribe retains the right to fish, hunt, and gather traditional foods (Yakama Nation 2010). Additionally, this area was used by native peoples across the inland northwest including the Wanapum, Spokane, Palus, and Kalispel (Walker

1998:1) However, Ray (1936:103,123) attributes the area directly to the Middle Columbia River Salishans (Miller 1998:254). The diverse array of groups termed the mid-Columbia Salishans includes the Wenatchee, Entiat, Chelan, Methow, Southern Okanogan, Nespelelm, Sanpoil, and Sinkayuse peoples (Miller 1998:254). Their territory, as depicted by Ray (1936), was generally bounded by the Columbia River to the north and west, Lower Crab Creek to the south, and Coal Creek to the east. By the late 1800s, a confederacy of several tribes represented by Chief Moses had banded together and fought to keep their traditional homelands which encompass the study area. Despite their efforts, a reservation was never established in the mid-Columbia Plateau and many of the Moses-Columbia people stayed in the region (Confederated Tribes of the Colville Indians 2019).

Travel of pre-contact people was by no means limited to perceived ethnographic boundaries; groups traveled to participate in salmon runs along the Columbia River and hunting or gathering camps in the Cascade Mountains (Miller 1998:253). As a result of Euro-American settlement over the last 250 years, these groups were decimated by disease, violence, and cultural genocide (Beckham 1998; Ruby et al. 2010; Walker and Sprague 1998). Resulting from the forced movement to reservations, the tribes of the project area now function as the Confederated Tribes of the Colville Indian Reservation, and include the Chelan, Chief Joseph band of Nez Perce, Colville, Entiat, Lakes, Methow, Moses-Columbia, Nespelem, Okanogan, Palus, San Poil, and Wenatchi (Confederate Tribes of the Colville Indians 2019).

The locations of interbedded tool stone, the Cayuse Phase chronological setting, and mid-Columbia River Salish ethnographic setting of the Mesa sites have direct

implications for lithic technological and functional variables discussed in the following chapters. The following chapter will review specific themes related to the study of the evolutionary archaeology, lithic analysis, and the Mesa sites to establish a site detailed context for this research.

CHAPTER III

LITERATURE REVIEW

Introduction

Variation in lithic technology and function between microenvironments has been compared in multiple contexts in the eastern Cascades and Columbia Plateau. Based on previous studies discussed above, four themes require review: application of evolutionary archaeology in the Pacific Northwest; Mesa site archaeological investigation on the Columbia Plateau; lithic analysis methods and techniques; and mid-Columbia Plateau pre-contact settlement models relevant to Mesa site occupation.

A growing body of work over the last several decades explores lithic variability through evolutionary archaeological theory with a variety of approaches (Andrefsky and Goodale 2015; Ferry 2015; Kassa and McCutcheon 2016; Lewis 2015; McCutcheon 1997; Parfitt and McCutcheon 2017; Senn 2007; Vaughn 2010). These studies and concepts are reviewed to support an evolutionary theoretical context for the current study. In addition, several excavations have occurred on Columbia Plateau mesa landforms and provide comparative data, specifically the similarities or differences in their analysis of lithic assemblages and their interpretations of pre-contact Mesa landform occupation (Clinehens 1961; Galm 2006; Kuntz 2009). Previous lithic studies applying evolutionary theoretical models and previous Mesa archaeological excavations have used a variety of lithic technological analysis methods to interpret variation (Dyson 2018; Ferry 2015; Lewis 2015; Vaughn 2010). The most used methods of aggregate and attribute analysis

are reviewed and those that prove to best fit the research goals are applied to the current study in the results chapter.

Finally, previous archaeological investigations on the Columbia Plateau have led to the development of predictive models based on archaeological and ethnographic information (Dunnell and Dancey 1983; Smith 1977:10-14). A review of these settlement and subsistence models will establish lithic technological and functional based expectations to compare against the gathered data, allowing for comparisons between an evolutionary archaeological based interpretation, and Mesa functional interpretation from previous studies.

Evolutionary Theory in Archaeology

This study assumes that evolutionary archaeological theory is the best fit to document what may be only subtle variation between lithic assemblages of riverine and hinterland Mesa sites. The subject matter is nonrandom sorting caused by natural selection, or in this case, the selective conditions/grain of the environment (Parfitt and McCutcheon 2017). There are two mechanisms by which nonrandom sorting is explained in the archaeological record: cultural transmission and natural selection (Dunnell 1978a, 1980). Within a given environment, natural selection is the process by which humans adapt to their environment and in doing so leave evidence of physical selective conditions on their material culture. For example, natural selection as represented by the differential availability of raw materials may influence the organization of lithic technology where those advantageous artifact attributes increase in frequency, thus patterning the physical process by which the artifact is reduced (e.g., McCutcheon 1997 and stone tool heat treatment). Cultural transmission is the

mechanism by which cultural phenomenon or behaviors move between individuals or groups (Dunnell 1996:91). Cultural transmission (the horizontal movement) can be detected in the archaeological record through style. Style “denotes those forms that do not have detectable selective values” (Dunnell 1978a:199) or are not associated with selective conditions within a given environment. Natural selection is in turn accountable through function and defined as “those forms that directly affect the Darwinian fitness of the populations in which they occur” (Dunnell 1996:40). Function is attributed to those artifacts that are associated with external environmental conditions and thus acts as a measure of selection (Dunnell 1978b). Both theoretically defined mechanisms can aid the existence, persistence, and modifications to particular stone tool manufacturing sequences and uses. Akin to biological evolutionary theory, researchers using evolutionary archaeology operate on the principle that natural selection will act on phenotypic variation (O’Brien et al. 2005). For this theory to be applied to archaeology, an artifact cannot be seen as a reflection of human behavior but instead as a physical extension, a phenotype of past peoples (Dunnell 1989; Leonard and Jones 1983). If an artifact is defined as part of the human phenotype then it can be influenced upon by the selective conditions of microenvironments allowing variation in artifacts to be sorted into nonrandom frequencies. In short, artifacts act as part of the phenotypes and can record past human behavior observed through nonrandom frequencies that are reflective of the selective conditions under which people made and used stone tools (Dunnell 1989; Parfitt and McCutcheon 2017).

The following section reviews the studies in the Pacific Northwest that have successfully used an evolutionary theoretical model to conduct lithic analysis. The

success of particular lithic analytical techniques and the attributes studied in them are detailed to best guide the development of lithic analytical techniques in the current study. The middle and southern Cascades have been subject to study by Ferry (2015), Lewis (2015), and Vaughn (2010) as a result of excavations at Mount Rainier National Park (McCutcheon and Dampf 2002). Additional work has been completed on the Columbia Plateau by Dyson (2018), Kassa and McCutcheon (2016), Parfitt and McCutcheon (2017), Senn (2007), and Woodard (2008).

Evolutionary Archaeology in the Pacific Northwest

Three material specific studies have addressed variation of lithic stone tool industries from the slopes of Mount Rainier (Ferry 2015; Lewis 2015; Vaughn 2010). In general, all three studies examine debitage attributes and stone tool types to identify selective conditions affecting phenotypic variability in lithic stone tool assemblages across microenvironments or through time. Lewis (2015) and Vaughn (2010) examine the same six sites in Mount Rainier National Park, while Ferry (2015) examined four sites. These studies consider use expectations from previous regional models (Burtchard 1997) and a cost and performance model (McCutcheon 1997) to examine lithic assemblage variability. Ferry's (2015) and Vaughn's (2010) work concentrated on changes in selective conditions between elevations and microenvironments, while Lewis (2015) examined the selective conditions that fix a lithic industry in stone tool making populations over time. In all three studies a cost and performance model in an evolutionary theoretical context was successful at identifying selective conditions that affect lithic industries.

While some variation in measured lithic attributes occurred between individual studies, each author used flake completeness (Sullivan and Rozen 1985) to demonstrate technological variability in debitage assemblages. Heat treatment, use wear (shape and kind), rock physical properties, material type, and reduction class were addressed in all three studies (Ferry 2015; Lewis 2015, Vaughn 2010). In general, the paradigmatic classification (Campbell 1985; McCutcheon 1997) was found effective at detecting variability between sites, but the application was limited in all studies due to sample size and the lack of consistency between previously conducted lithic analytical methods between sites. Specific selective conditions were identified in all studies and included stone tool movement along trails (Vaughn 2010), pyroclastic events (Ferry 2015), and raw material source distance (Lewis 2015). All studies identified raw material source distance as a selective condition. Only Ferry's (2015) results directly support proposed mid-Cascade settlement models, whereas results from Vaughn (2010) and Lewis (2015) only partially met settlement model expectations. Many of the attribute frequencies were unique to individual sites, in some cases resulting in the identification of significant variation within the same microenvironment (Vaughan 2010). However, in all cases variation in lithic technology across microenvironments was detected with multiple selective conditions identified. The most significant selective conditions found by any of the three authors were the proximity of raw material sources (Ferry 2015; Lewis 2015) and stone tool movement along trails (Vaughn 2010). Both of these selective conditions will be considered for the sites in the current study and can be examined through possible stone tool source locations and historic research. Ultimately, the largest analytical issues

stated in Ferry (2015), Lewis (2015), and Vaughn (2010) were small sample sizes and lack of consistently recorded lithic attributes between sites.

Evolutionary Archaeology on the Columbia Plateau

Five lithic analysis studies using an evolutionary archaeology theoretical model have been conducted in the mid-Columbia Plateau. Two of these studies concentrate on the relationship between obsidian material quality, examining its impact on lithic technology (Kassa and McCutcheon 2016), and “source to technology relationships” at the Grissom site (45KT301) (Parfitt and McCutcheon 2017:38). Dyson (2018) applies an evolutionary theoretical framework to assess the level of variation through time present at 45KT315 on the Yakima Training Center where she tracked lithic technological changes between the Windust and Cascade dated components. Senn (2007) and Woodard (2008) examined relationships between microenvironmental factors and surface artifacts in the eastern Saddle Mountains. In general, each study follows similar theoretical and analytical frameworks as McCutcheon (1997), Ferry (2015); Lewis (2015), and Vaughn (2010) using a cost and performance model. The following studies made significant contributions to stone tool procurement knowledge on the Columbia Plateau that may have implications regarding lithic technology at the Mesa sites.

Kassa and McCutcheon (2016) applied evolutionary archaeological theory to test the null hypotheses that obsidian sources occurred randomly within stone tool manufacture by examining the variation of obsidian artifacts using 18 sites along the northern and southern reaches of the middle Columbia River. Parfitt and McCutcheon (2017) expand both the rock physical properties and technological categories from Kassa and McCutcheon (2016) to include material type, cortex grain size, cortex solid and void

inclusions, distribution of ground mass inclusions, platform type, wear, cortex amount, and thermal alteration. Similar to Lewis (2015), Ferry (2015), and Vaughn (2010), both of these studies also employ the Sullivan and Rozen (1985) typology as an analytical tool to supplement stone tool attribute analysis and to make their results comparable among assemblages. Both studies also compare against previous trade and tool stone procurement models (Galm 1994; Renfrew 1977). Ultimately, Kassa and McCutcheon (2016) found that local sources were favored for their low cost despite their lower raw material quality when compared against non-local obsidians. Parfitt and McCutcheon (2017) focused on establishing if the Grissom site was used for trade, to examine the diversity of source types, how close the source was to the site, and the technological attributes of the artifacts related to physical properties of the obsidian. Parfitt and McCutcheon (2017:62) concluded that site to source distance was only one of the variables that influenced obsidian occurrence. In the context of this study, the Mesa sites have nearly no exotic tool stone and are dominated by chert material types (Smith 1977:61-64). The overwhelming preference of local tool stone at the Mesa sites may be explained by a cost and performance model as shown by Kassa and McCutcheon (2016).

Dyson's (2018) analysis of the Sanders site assemblage successfully identified directional selection when examining use wear, material type, reduction stage, and thermal alteration between site components. While Dyson's (2018) study was restricted due to sample size, the author's analysis found tentative evidence for changes in thermal alteration and stone tool material choices through time which were selected for by shifts in climate (Dyson 2018:119). While the results of this work contributed to changes over time at the Sanders site, they were limited due to low sample sizes.

Senn (2007) and Woodard (2008) proposed that the archaeological record was distributed nonrandomly across microenvironments in the upland landscape of the Saddle Mountains. Senn's and Woodard's approaches differed in technique from the studies discussed above in that individual surface artifacts were spatially analyzed in relation to specific microenvironmental features including soil type, solar radiation, vegetation, landform, and tool stone raw material occurrence. Senn (2007) and Woodard (2008) addressed total artifacts, core, and flake distance to tool stone-bearing interbeds. Both studies found that significant relationships existed between artifacts, tool stone-bearing interbeds, and landforms. Significance between other artifact types and environmental features varied although most tests were non-significant.

Based on the research discussed above, a connection between microenvironments and lithic assemblages exists both in upland regions around Mount Rainier and on the mid-Columbia Plateau (Dyson 2018; Lewis 2015; Senn 2007, Vaughn 2010; Woodard 2008).

History of Mesa Archaeology on the Mid-Columbia Plateau

While Smith's (1977) work is the only study to include primary data from multiple Mesa sites, several other archaeological investigations have been conducted on Mesa landforms in the Columbia Plateau (Clinehens 1961; Galm 2006; Kuntz 2009; Miss 1997; Ruebelmann 1973, Swanson 1962) (Figure 5). Except for Galm (2006) and Smith (1977), little to no comparative analysis has occurred to place the sites within a mid-Columbia Plateau archaeological context.

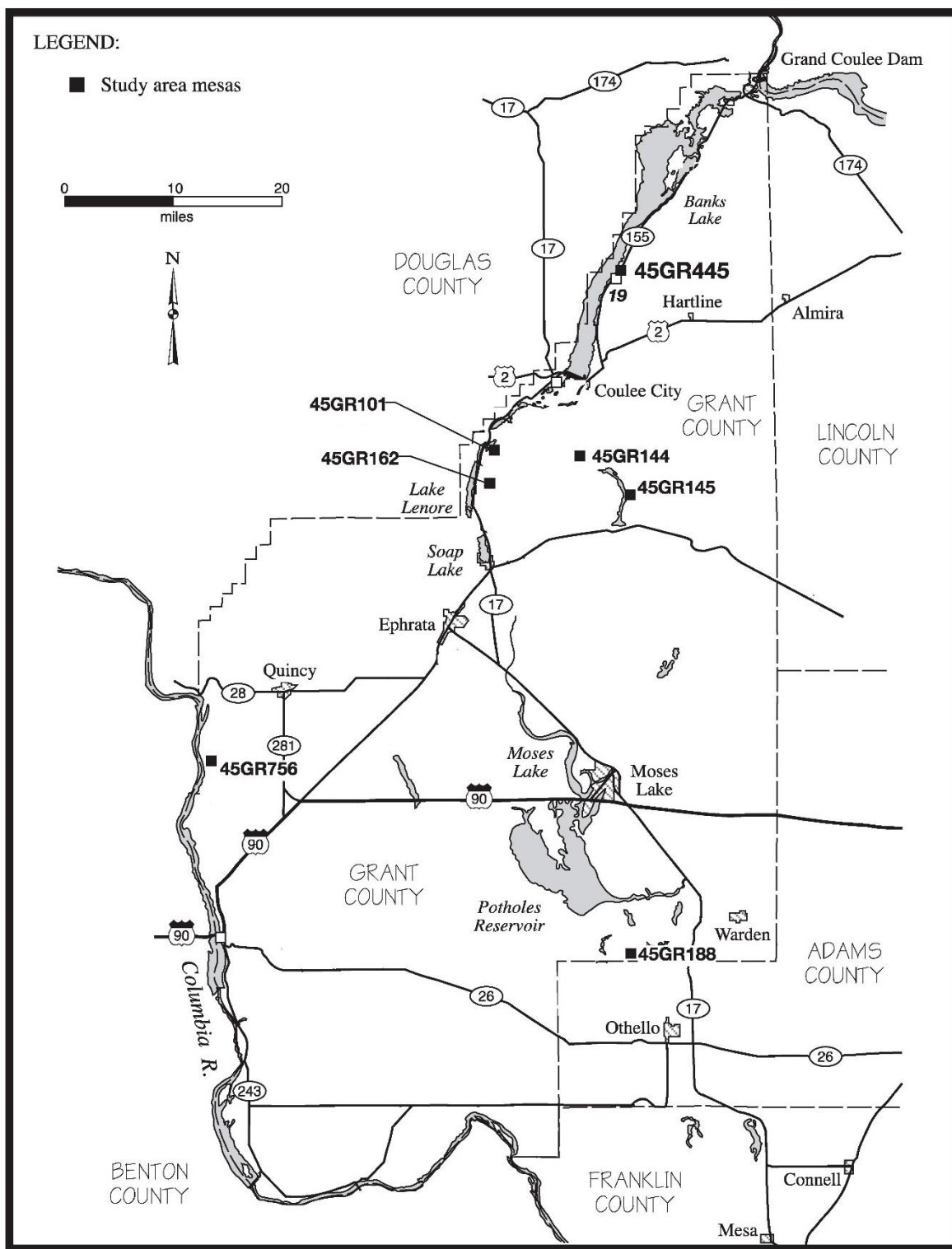


Figure 5. Mesa Sites Discussed in Chapter II (adapted from Galm 2006:18.8).

The following review of previous work is organized first by projects that cover multiple Mesa sites or rely on Mesa site data for comparative analysis (Chatters 2004; Lothson 1989; Smith 1977; Washington 1973) and followed by individual site studies (Clinehens 1961; Galm 2006; Kuntz 2008) in chronological order. The review sets forth expectations for the results of this study and build a spatial, chronological and functional setting for the Mesa site type. All of the sites below were initially documented by Washington (1973). The Mesa number reference system is arbitrary and stems from the order by which Washington (1973) located them.

Comparative Mesa Projects

Reference to pre-contact occupation of Mesa landforms on the Plateau does not appear in published or gray archaeological literature until Stephen Clinehen's excavation of Mesa 11 in 1961 (Clinehens 1961). However, the Mesa sites were the subject of discussion and interest beginning in the 1950s with Senator Nat Washington's intensive survey that eventually documented 55 Mesa sites (Washington 1973). In fact, hundreds of sites in the Grand Coulee area owe their identification to Washington's work. In 1956, Washington (1973:1-2) visited a site (Mesa 1) southeast of Ephrata with members of the Nez Perce tribe, one of whom, Billie Curlew, had grown up in the area. Billie Curlew was born in the mid-nineteenth century and was told that the Mesas once had been used both as fortifications and habitation sites. This was corroborated by additional informants; however, none were local. Washington (1973) takes this oral tradition further and makes correlations with southwestern style Mesa dwellings and coins the term "Mesa Forts," although the Mesa fortification idea has earlier roots.

Washington's (1973) report used the knowledge that he gained from Billie Curlew, the Nez Perce tribal member, to support the Mesa forts theory. However, this is based on the idea that the Mesas were used as refuge by Sinkayuse peoples from mounted Blackfeet raiders (Washington 1973:12). While there is no archaeological information to disprove this assertion from 1500 BP-present, radiocarbon analysis from the Mesa sites suggest the reuse of Mesa sites between 2000 and 200 years BP, well before the introduction of horses in the late 1700s (Ames et al 1998:122; Smith 1977:67). Washington (1973) expands on the fortification idea by discussing the movement of peoples on the mid-Columbia Plateau and comparing the sites to southwest Pueblo cultures who did use Mesa formations for defensive purposes. Central to defensiveness and movement of pre-contact peoples is the northern movement of Salish and Palus peoples from a border on Crab Creek into the central Columbia Plateau (Teit 1928:123). At the time Washington published his report, the peace theory of the Plateau, a notion based on Ray's (1932) ethnographic study that Columbia Plateau tribes generally were peaceful, still prevailed in archaeological literature, rendering Washington's (1973:3) interpretations controversial to the archaeological community.

Based on the following literature review, the functional interpretation of the Mesa sites as temporary camps, hunting locations, or defensive refuges has almost exclusively centered on their seemingly unique assemblages of dry laid basalt walls, cairns, and alignments. Stacked rock features are common across the Columbia Plateau and have drawn attention from researchers for over 100 years (Smith 1910). Harlan Smith (1910:82) provides a combined functional and morphological set of identifications based on the characteristics of stacked rock walls and debitage on a 15-foot high mesa along

Rock Creek in southeastern Washington. Smith (1910:82) uses the term “fortifications” but writes little else on the subject. The site he described on Rock Creek also reportedly contained burials, other stacked rock features, and house pits. Additional researchers (Caldwell and Coulson 1954) suggested ceremonial uses while Osborne (1967) prescribes the term fortifications to the basalt features. Lohse and Sprague (1998) note that Columbia Plateau archaeology was slow to move from the mid-twentieth century culture history paradigm that drove American archaeology for much of the twentieth century. It was not until the mid-1970s that Columbia Plateau culture was truly considered unique from neighboring regions such as the Great Basin (Lohse and Sprague 1998), despite earlier suggestions made by Ray (1932). The speculation and research into Mesa site function by Smith (1977) contributed to the uniqueness of Columbia Plateau archaeology and was an important step towards developing detailed artifact classifications and testable hypothesis in archaeological research.

The Mesa Project 1973-1975

As a result of Washington’s work, Dr. William Smith (1977) of Central Washington University organized the first Mesa Project to study and mitigate the most extensive and threatened Mesa sites. At that time, the sites lacked formal study aside from a brief mention of Mesa 11 by Clinehens (1961) and were subject to looting. Smith and Washington recognized the uniqueness of the sites and planned a comparative analysis of the seven most threatened sites with support from Washington State Parks. Smith (1977) also realized the value of hinterland archaeology on the Columbia Plateau which at the time had seen almost no formal study. As the first professional comparative study, Smith (1977:68-76) concentrated research on the basalt features and proposed

defensive functions which were at the center of the then-new debate of pacifism and conflict on the Columbia Plateau. The excavations focused on collecting artifact assemblages that could date the occupation of the sites and provide information regarding the functions of the basalt features. Excavations were conducted at Mesa sites 06, 12, 30, and 36 as they were believed to be most likely to be impacted by artifact hunters. The remaining three sites (Mesa 09, 11, and 17514-14) were investigated at a surface inventory level. The chosen locations for excavation on each Mesa site were driven primarily by where soil was present to excavate. The aeolian deposited silt on the Mesa tops results in shallow depth to bedrock (30 cmbs at the deepest), and soil collects in low spots between natural basalt ridges on the Mesa tops.

Lithic debitage, as reported by Smith (1977:63-64) dominates the excavated Mesa assemblages: n=6,770 at Mesa 06; n=4,829 at Mesa 12; n= 2,537 at Mesa 36; and n=1,143 at Mesa 30. Smith (1977:82) recommends comparisons to sites in different environments and more “sophisticated” artifact classifications. The lithic categories defined by Smith (1977:48-60) included 27 individual categories. Smith used a classification system based on portability, modification, and composition. For example, class 112 refers to artifact (1), use modified (1), basalt (2) (Smith 1977:45,49). The definitions were provided in thorough detail, a still uncommon practice in contemporary lithic analysis studies. Flakes were divided into debitage, chunks, use modified, and detritus. Cobbles were separated/categorized into chipped, crushed, abraded, and composite categories. Unifaces were categorized as awls, end-scrapers, and side scrapers while bifaces were divided by large and small sizes. Projectile points were divided by morphological characteristics, triangular, fragmented, miscellaneous, and side, corner,

basal, or double notched shapes. Until Smith (1977:2), the Mesa sites had not been placed in any formal chronological sequence. The original dates given by Smith (1977:67) are based on un-calibrated bulk charcoal samples in radiocarbon years before present (Table 2). Based on these samples Mesa 06 was occupied between 220-615 BP, Mesa 36 between 945-1015 BP, and Mesa 12 between 110 and 2700 BP (Smith 1977:67). Numerous features, including house pits, hearths, and activity areas associated with high recovery rates of lithic debitage were recorded during the excavation effort.

Table 2. Original radiocarbon dates (Smith 1977:67)

Site #	Cat. No.	Provenience	Sample ID	Material	BP	Cultural Phase
Mesa 06	N/A	06082602	I-9436	Bulk Charcoal	305 ±75	Cayuse
Mesa 06	N/A	06082602	I-9437	Bulk Charcoal	220±115	Cayuse
Mesa 06	N/A	06082602	I-9438	Bulk Charcoal	615±145	Cayuse
Mesa 12	N/A	120106	I-7735	Bulk Charcoal	2070±90	Frenchman Springs
Mesa 12	N/A	120116	I-7736	Bulk Charcoal	1100±90	Cayuse
Mesa 12	N/A	120119	I-7737	Bulk Charcoal	1230±95	Cayuse
Mesa 12	N/A	122101	I-7738	Bulk Charcoal	<180 ^a	Cayuse
Mesa 12	N/A	122602	I-7739	Bulk Charcoal	565±80	Cayuse
Mesa 12	N/A	12260401	I-7750	Bulk Charcoal	1240±80	Cayuse
Mesa 12	N/A	12260402	I-7749	Bulk Charcoal	1605±90	Cayuse
Mesa 36	N/A	360502	I-7751	Bulk Charcoal	1015±90	Cayuse
Mesa 36	N/A	360503	I-7752	Bulk Charcoal	945±80	Cayuse

^aLab dates and raw ages from Smith's (1977:67) published table are based on Teledyne Isotopes' laboratory data records. Note that the date used here was reported incorrectly in Smith (1977:67, radiocarbon date table).

Mesa 06 (45GR162)

Mesa 06 site is in an unnamed coulee which is divided from Lenore Lake to the west by the Great Blade, a massive linear upper colonnade basalt formation with its own set of archaeological features. The top of Mesa 06 is about 2,300 square meters with sheer sides, the shortest of which is approximately 20 feet high on the east face, making access impossible without climbing (Figure 6). The southern, western, and northern faces are completely unscalable. The southern face has a large rock shelter that is mostly filled with basalt rubble; no evidence for pre-contact occupation was found in the shelter although no subsurface testing was conducted (Smith 1977:18). Based on a review of geologic sources discussed in Chapter II, the nearest potential raw material source is a contact between the Frenchman Springs formation and Quaternary alluvium, 606 meters southeast of the site. Additional contacts between Frenchman Springs and Priest Rapids basalts are located on the Great Blade formation, 700 meters to the northwest.



Figure 6. 2018 Overview Photo of Mesa 06 Excavated Area

Washington (1973) first notes Mesa 06 in the mid-1960s. Smith selected the Mesa for further testing and led a crew to excavate 5.2 m³ of soil in 28 one-by-one-meter units during October of 1975, recovering 7,720 flakes (Smith 1977:61-64) (Figure 7). In addition to excavation, the basalt walls and cairns characteristic of the mid-Columbia Plateau Mesa sites were recorded and photographed in detail.

Fifteen surface features were recorded, consisting of three cairns and twelve rock walls constructed from local angular basalt chunks. Seven subsurface features were identified and consist exclusively of potential hearth features. The hearths were generally identified as changes in soil color with the addition of basalt chunks. Occasionally these features were accompanied by ash layers. Smith (1977:67) submitted three mass radiocarbon dates for analysis from Mesa 06, establishing an age range of between 220 ± 115 BP to 615 ± 145 BP based on un-calibrated radiocarbon years before present.

Mesa 12 (45GR144)

Mesa 12, first recorded by Washington in the mid to late 1960s, is located 6.25 miles east of Mesa 06 in Dry Coulee. At approximately 3,000 square meters in size, the landform is slightly larger than Mesa 06 but about 20 feet higher (Figure 8). Nearly 30-meter-high sheer columnar basalt topped with entablature compose the Mesa, only broken on the southern point by a small rough path (Smith 1977:24). Based on analysis of geological sources discussed in Chapter II, a contact point of Frenchman Springs and Undifferentiated Basalts is located 103 meters northwest and represents the closest potential source of lithic raw material. At the base of this path the site continues onto the coulee floor (Area 1201) (Figure 9). This lower area is unique to the Mesa sites examined in this study and has extensive lithic and faunal deposits but no stone features, unlike the top of the Mesa. While Mesa 30, not included here, had a similar lower component it was not selected as part of this study because less excavation took place and the site had been impacted by artifact hunters.

Excavations in 1975 recovered 4,829 flakes from 33 units (6.3 m³) at Mesa 12 (Smith 1977:63-64). Additionally, 376 tools were recovered from all excavated proveniences and the site surface. The faunal remains from Mesa 12 were subject to analysis by Fitzpatrick (2018), who found that faunal remains consisted primarily of mammal species. Most importantly, Fitzpatrick (2018) concluded that the Mesa top partially functioned as a habitation site.

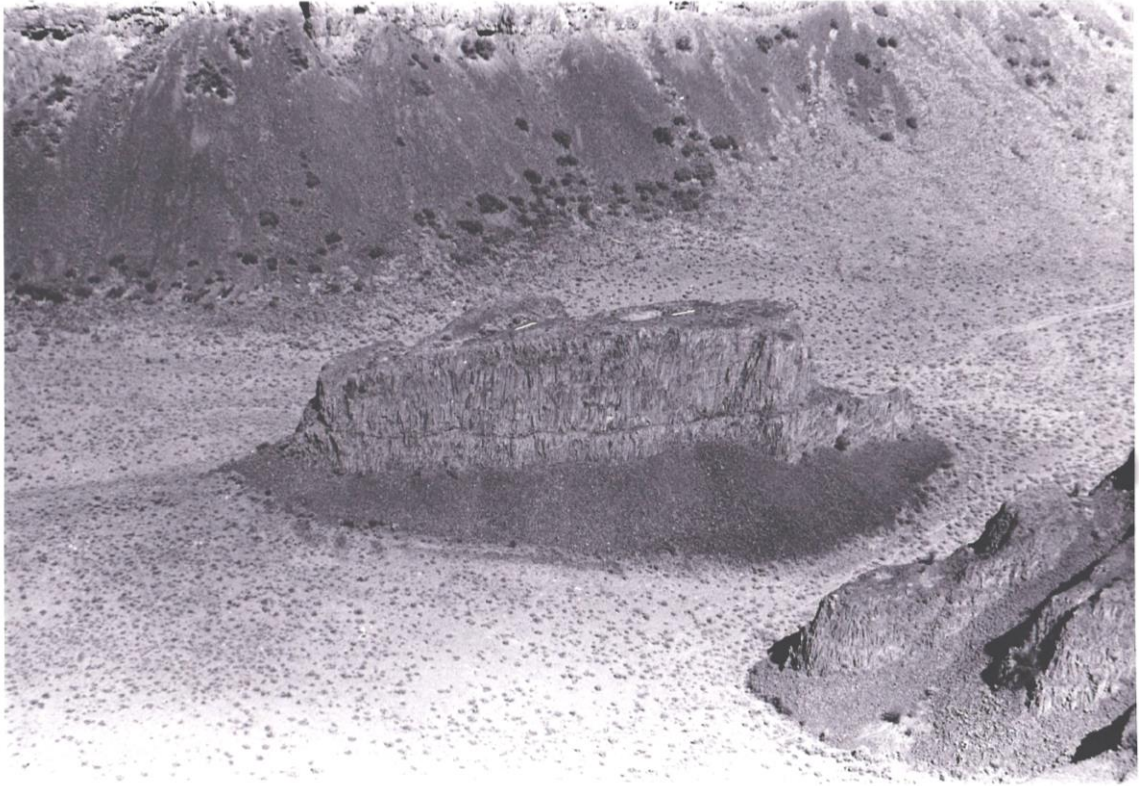


Figure 8. Mesa 12 (Courtesy of Dr. William Smith 1975 Unpublished Photo)

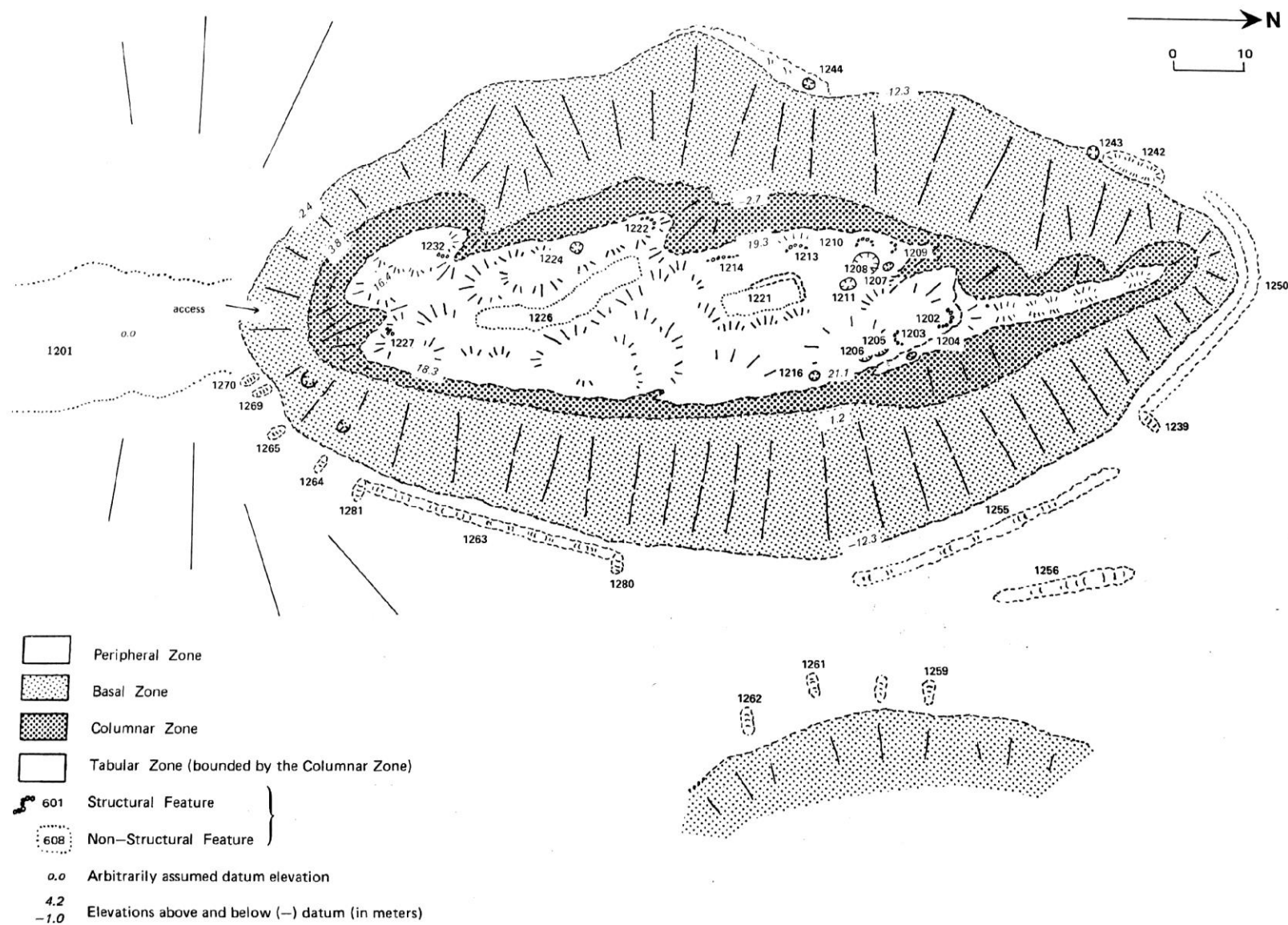


Figure 9. Mesa 12 Site Map (Smith 1977:30)

Forty-six individual features were identified and recorded during excavation of Mesa 12. Thirty-eight of these were basalt structures or pits, three were activity areas, and seven were subsurface hearths. Seven bulk radiocarbon samples were submitted for analysis, three from the bottom of the Mesa and four from the top. The dates range from 150 to 2070 BP based on un-calibrated radiocarbon years before present. Dates from the bottom of Mesa 12 (Area 1201) range from >150 to 2070 \pm 90 un-calibrated radiocarbon years before present while the occupation at the top of Mesa 12 ranges between 565 \pm 80 and 1605 \pm 90 un-calibrated radiocarbon years before present (Smith 1977:67).

Mesa 36 (45GR145)

The final site studied as part of the three large excavations during the Mesa project, Mesa 36, is roughly six miles east of Mesa 12 and eleven miles east of Mesa 06 on the eastern shore of Billy Clap Lake. While still a large formation, the Mesa slopes more gently on the eastern side and is terraced, allowing slightly easier access than at Mesas 12 and 06 but still requiring a significant climb. The largest of the three sites directly addresses in this thesis at 7,800 square meters, the Mesa is approximately 30 meters tall forming sheer cliffs on the western side and four terraces separated by five to ten meters in height (Smith 1977:34-35). Based on analysis of geologic sources discussed in Chapter II, a contact between the Frenchman and Roza basalt flows is adjacent to the east side of Mesa 36, separated from the site by a spring, making the presence of interbedded tool stone extremely likely. Only the top of the Mesa was tested, and no archaeological deposits were recorded below the Mesa on the eastern side. The western side is inundated by Billy Clap Lake.

A total of 2,537 flakes were recovered, in addition to 99 tools from 11.3 m³ of excavation. Faunal remains were also present but have not been subjected to formal analysis. Thirty-one features were identified across the Mesa top and consist of basalt alignments, walls, and pits (n=19); lithic concentrations (n=221); circular depressions (n=1); rectangular house pits (n=2); and basalt cairns (n=2) (Figure 10). Two bulk radiocarbon dates were gained from charcoal samples. Smith (1977:67) reported the youngest date as 945 ± 80 BP and the oldest as 1015 ± 90 , both dates based on uncalibrated radiocarbon years before present.

Two of the several research directions suggested by Smith (1977:81-82) are most relevant to this study: 1) "Full understanding of the significance of the mesas themselves ultimately will require investigation of non-mesa sites, particularly those located in the Channeled Scablands of the Columbia Basin"; and 2) "The analysis of such data should incorporate a more sophisticated system for the classification of both artifacts and features." Smith (1977:75-76) was not able to explicitly address a hypothesis based on previously proposed defensive functions. However, he does conclude that the sites were used as part of subsistence and settlement systems (Smith 1977:82).

Chatters (2004)

The most recent published work to address the possible functions of the Mesa sites was conducted by Chatters (2004) who makes a connection between forensic evidence from the Columbia Plateau and defensive village locations. Chatters (2004) incorporates discussion of the Mesa sites into a larger debate, asking if advances in projectile technology (like the bow and arrow) were the reason for the middle and late pre-contact shift to large pithouse-based occupation sites. Using Smith's (1977) report

and oral history evidence, Chatters uses a cost/benefit approach to life in or away from villages, concluding that life away from villages was hazardous and “defense is the only explanation for Mesas” (Chatters 2004:70). Forensic evidence of cranial injuries from the Southern Plateau is added to support the well-debated pacifism or conflict theories of pre-contact Columbia Plateau life. Chatters relies on assumptions regarding the introduction of bow and arrow technology, which have been heavily debated (Ames et al. 2010).

Lothson (1989) Bighorn Sheep Procurement

Lothson’s (1989) dissertation concentrated on the use of the Columbia Plateau Mesa sites as drive and ambush bighorn sheep hunting sites. His research rested on examples from Great Basin sites and ethnographic accounts of using mesa-like formations and stacked rock walls to force bighorn sheep into narrow spaces and ambush them with bow and arrows. Columbia Plateau evidence for the model was based on ethnographic accounts collected by Ray (1954) and Leslie Spier (1938) of sheep hunting at watering holes, and because big horn sheep are depicted on mid-Columbia Plateau rock art. Specific to lithic technology, Lothson (1989:178,197) expected the Mesa sites to have very little core reduction and lithic patterns to indicate specific (limited) activity patterns. Lothson (1989:410) suggested that bighorn sheep procurement likely took place at the Mesa sites as an ambush and drive system, employing more limited trapping techniques when compared to similar use sites in the Great Basin or Plains. Lothson (1989:411-412) admitted that his proposed model does not uniformly fit Smith’s (1977) Mesa sites, and that alternative functions such as habitation, root procurement, vision quest sites, or a combination of all three are very likely.

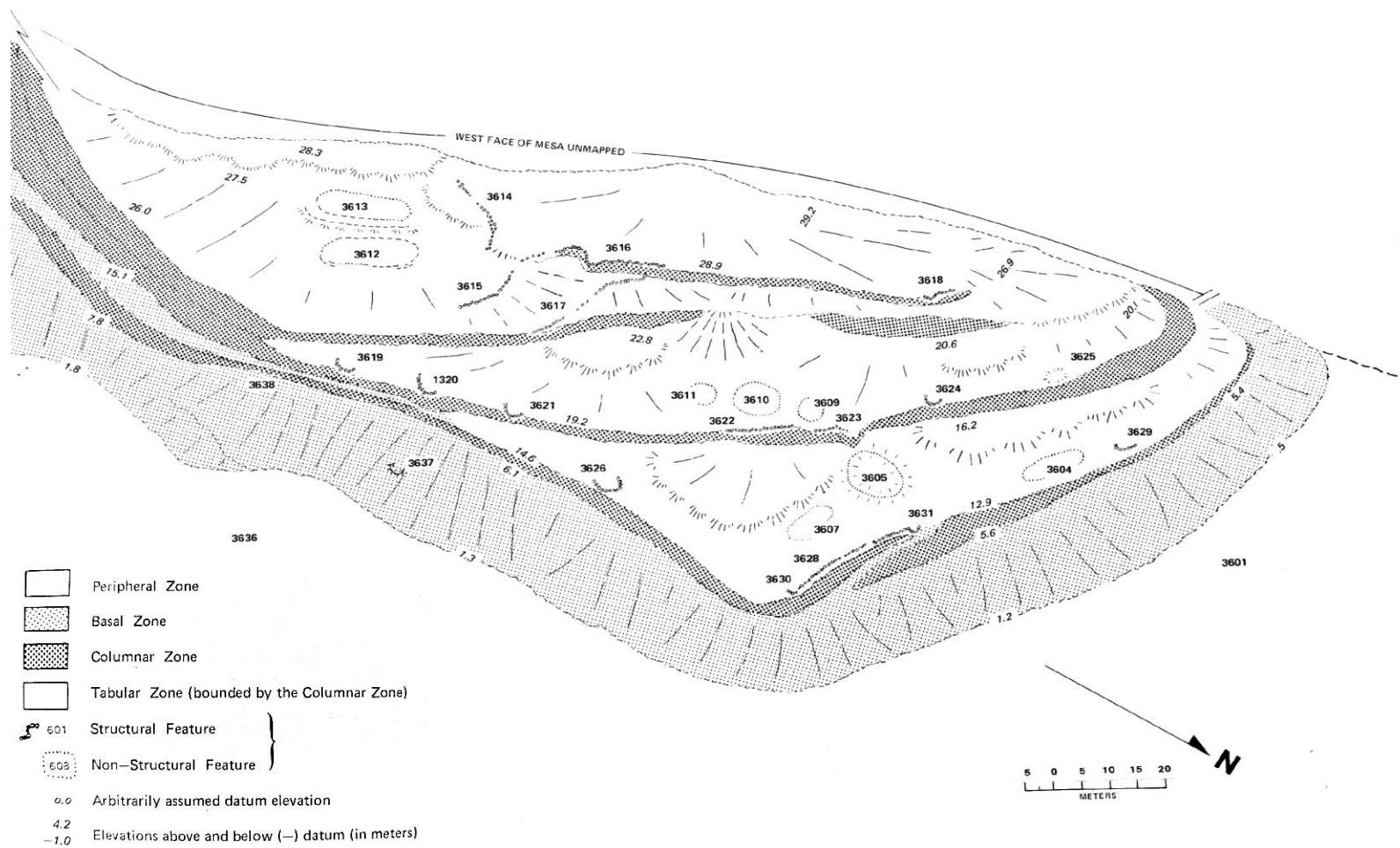


Figure 10. Mesa 36 Site Map (Smith 1977:34-35)

Individual Site Studies

The following studies represent individual excavations of Mesa site landforms as defined in Chapter I. Those studies by Miss (1997) examining the Smokian and Sam Israel sites are omitted because they do not fit the geographic definition of any other Mesa sites considered in this study.

Salishan Mesa, Mesa 18 (45GR445)

Galm's (2006) study is by far the most extensive modern Mesa study. The report details excavations and research that took place from 1987 to 1988 at the Salishan Mesa in the central Columbia River Basin. Jerry Galm, and other report contributors, analyzed tens of thousands of artifacts and include one of the most intensive regional reviews available. The study found that Mesa 18 was unique out of the approximately 50 sites first documented by Washington (1973) as it extends over 4,000 m² (Mesa top is 1,400 m²). The site is divided into Area A and Area B. Area A includes the Mesa top and the immediate locations around it. Area B is a habitation site with a spring located adjacent to the mesa portion of the site. Mesa 19 is adjacent to the southwest and is included in the surface artifact and feature inventory but was not excavated (Galm 2006).

A variety of materials were recovered, primarily consisting of lithic debitage (n=5,731, Area A; n=97,025 Area B [Galm 2006:7.1]). The excavated area was disproportionate between Area A (12.6 m²) and Area B (43.7 m²). A total of 1,156 lithic tools were recovered from both Area A and Area B. Sixty-three features were recorded at Mesa 18 and included stacked rocks or rock pits, artifact concentrations, pit houses, and hearths. Galm (2006:8.7) surmised that lithic materials showed high variability in material quality and expedient technology dominated the assemblage when tested against

the Chief Joseph Dam Project assemblages. Specifically, he noted that “expedient technology is devoid of standardized core-flake reduction technology” (Galm 2006:8.6).

Raw material is present at and around the Salishan Mesa in the form of small workable nodules, suggesting raw material choice was opportunistic as seen in the high occurrence of expedient tools (Andrefsky 1994; Galm 2006). Dart-sized projectile points (as opposed to atlatl sizes) and the high frequency of bifacial artifacts were used to suggest that hunting was the predominant site function during the late Holocene (890-2490 calibrated radiocarbon years before present [cal rcy BP]). Mass aggregate debitage analysis was conducted and consisted of nominal categorization of flakes by type and raw material (Galm 2006:7.27). The analysis generally found a high rate of intra-site variability with stone tool manufacturing concentrating on maintenance with frequent late-stage tool production. Very little use wear on flake tools suggested a short life span of stone tools (Galm 2006:7.36).

Mesa 11 (45GR101)

In the late 1950s, Stephen Clinehens (1961) surveyed and partially excavated 45GR101 (Mesa 11), a Mesa site located approximately two miles north of Mesa 06 east of Lake Lenore. Site 45GR101 is typical of recorded Mesa sites with nine stacked rock features, sparse surface chert lithics, and difficult access routes, although documentation is limited. The Mesa top totals 2,264 m² and has no recorded artifact assemblages or features at the bottom. The only excavated feature (Feature 2) had 50 centimeters of soil deposition with lithic artifacts and charcoal concentrated between 0 and 20 centimeters below surface. This pattern was also observed at Mesa 06, 12, and 36 (Smith 1977:41). Volume excavated and control method are unknown.

Artifact descriptions and frequencies are not included; however, Clinehens (1961:48) noted that the flakes represent late stage reduction and a lack of cores. Citing Osborne's (1958) Sun Lakes report, Clinehens (1961) suggests the Mesas may have been used for spirit quests, fortifications, or game lookout points.

Lee Site Mesa 50 (45GR756)

The Lee Site was officially recorded in 1999 by Charles Luttrell, but acknowledged much earlier by Swanson (1962), who completed test excavations in 1954 and used the site as partial evidence in the first Columbia Plateau focused cultural historical sequences study. Kuntz (2009) completed a thesis focused on the National Register of Historic Places (NRHP) eligibility of the Lee Site. The site is a sheer walled Mesa (4,000 m²) located only eight miles south of 45DO673, the riverine site used for comparison in Chapter V

Kuntz's (2009) test excavations of the site consisted of shovel probes that revealed a variety of cultural material including 1,592 lithic artifacts. Excavations were focused on five recorded house pits at the site; some were partially disturbed by looting. The lithic assemblage was dominated by chert with limited recovery of projectile points (n=17), bifaces (n=4), utilized flakes (n=4), cores (n=2), scrapers (n=3) and ground stone (n=7). Kuntz (2009) used Sullivan and Rozen's (1985) typology to record lithic debitage in addition to noting heat alteration (after McCutcheon 1997), size, and material. Accelerator Mass Spectrometry (AMS) radiocarbon dates taken from charcoal fragments suggest the site dates to 1,000-2,000 cal rcy BP, similar nearly all other recorded dates from Mesa site occupations on the mid-Columbia Plateau. Ultimately, Kuntz (2009) found that tool and core reduction were evenly represented on the site with a high

projectile point density and stone tool diversity. Kuntz (2009:74) suggests that the Lee Mesa Site experienced both short and long-term occupancy during the late pre-contact, concentrating on resource extraction and ultimately aligning with Smith's (1977:74-75) interpretation of Mesa sites.

Previous Archaeology at 45DO673

First recorded in 2001, 45DO673 is an occupation site along the east bank of the Columbia River and is used as the comparative riverine location in Chapters V and VI. Based on diagnostic artifacts and eight bone collagen dates, the site was occupied between 4220 to 4800 cal rcy BP. The site has been tested twice and ultimately was determined eligible for the NRHP (Cowan et al. 2011). Data recovery excavations were conducted by Root et al. (2016) in the exposed portion of the site. Two separate areas, named North and South, were excavated for a total of 42.6 m³ (Figure 11). In general, lithic artifacts occurred in low densities across the site. Although few lithic artifacts were recovered, they consisted of a diverse range of tool and debitage types. The authors acknowledge that their excavation was not a representative sample of the entire site, due to inundation by the adjacent reservoir. However, a wide range of activities including hunting, plant food processing, and fishing are represented by the recovered assemblage (Root et al. 2016).

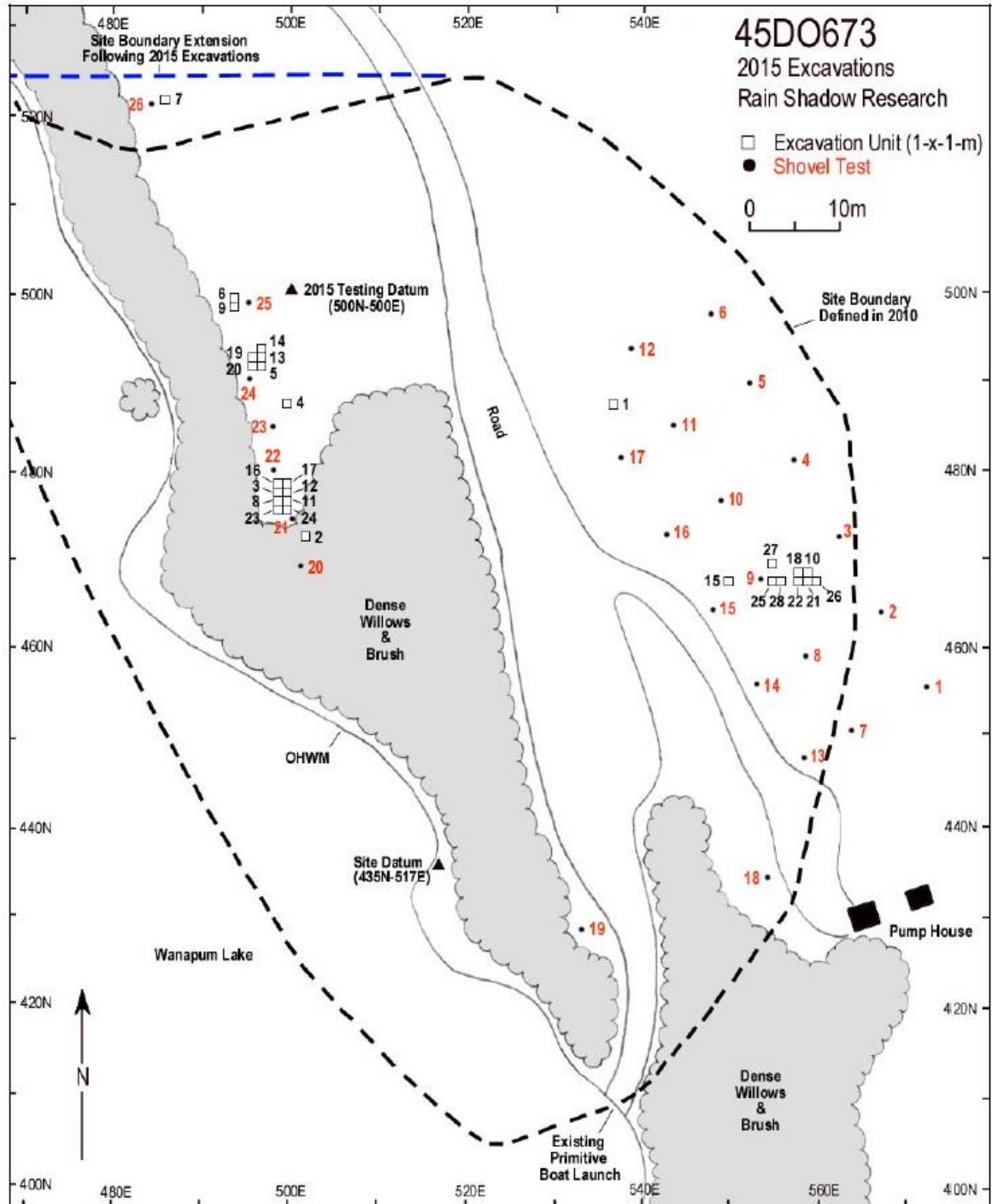


Figure 11. Northern Excavation Area of 45DO673 (Root et al. 2016:41)

While the assemblage may not be an ideal representation of a village occupation, it does have diverse activity types occurring in a separate microenvironment from the Mesa sites. In addition, there are few data recovery projects of middle to late period sites

on the mid-Columbia Plateau that have included lithic analysis with attributes which are directly comparable to other sites in the mid-Columbia Plateau. Root et al.'s (2016) descriptions of stone tools were sufficiently detailed so that types could be directly correlated to the broad categories used in this study, thus offering more powerful direct comparisons of technology between microenvironments. Inconsistency of lithic analysis methods has been detrimental to lithic assemblage study and analysis for decades (Sullivan and Rozen 1985). The following section establishes the context for why the specific methods and techniques discussed in Chapter IV were selected for this study and overviews their interpretative values and critiques.

Lithic Debitage Analysis Context

This section reviews the background, critiques, and values of the lithicdebitage techniques employed in this study. The selected techniques were chosen for their ability to efficiently measure variability within largedebitage assemblages and facilitate comparisons to past and future studies on the Columbia Plateau. Debitage variability allows one to detect technological and functional variability between lithic assemblages in an evolutionary theoretical context.

Aggregate Analysis

Aggregate analysis separatesdebitage in a stratified or uniform system. This technique can be used to measure frequency, weight, and size while accomplishing both replicability and verification in the study (Andrefsky 2001). Following initial sorting, size class analysis aids in separating those artifacts that frequently exhibit attributes and that are representative of differential selective conditions.

Researchers using aggregate analysis argue that the technique can produce technological results from large amounts of debitage quickly compared to attribute or typological analysis methods (Ahler 1989). This is useful to any researcher dealing with large lithic assemblages. The interpretative power of the method increases when compared to experimental assemblages. Root (1992, 1997) and Ahler (1989) provide examples of experimental data sets used to show more detailed reduction using statistical analysis such as multiple linear regression. Despite being an attractive option for large assemblages, aggregate analysis alone cannot confidently detect nonrandom sorting in lithic assemblages. Researchers over the last three decades have determined that additional analyses are required to support aggregate analysis results.

Ahler (1989) was the first to point out the now well-known issues surrounding the quantification of size grades by average weight. Since most archaeological sites are the results of multiple uses over large spans of time, it is likely that different reduction technologies were used in the same location, creating mixed assemblages. Various authors (Ahler 1989; Stahle and Dunn 1982) using experimental lithic assemblages have demonstrated that aggregate size grade analysis divided by flake counts or weights cannot effectively discriminate between different reduction technologies. While general statements regarding reduction stages are valid, determinations concerning bifacial tool reduction or core reduction require either comparative statistical analysis with experimental assemblages or attribute analysis, combined with stone tool analysis, to reliably discuss reduction technology from aggregate size grade analysis (Andrefsky 2005a; Root 2004; Shott 1994). The reliance on experimental assemblages creates a unique set of issues and should be used in broad terms, not to determine specific flaking

technologies based on extremely limited examples of specific flake types (Williams and Andrefsky 2011). Williams and Andrefsky (2001:869-872) illustrate that when controlling for raw material, flint knapper experience level, hammer type, and other variables, a wide variation in debitage between individual flint knappers is detectable. This variation is most frequently observed on debitage weight, flake types, flake dimensions, and platform dimensions variables. Their results indicate that experimental assemblages, whether made by a single or multiple flint knappers, are unlikely to represent nonrandom sorting in the archaeological record. Specifically, the amount of certain debitage types, such as debris (used to indicate specific technologies like core reduction) are highly variable between flint knappers, suggesting that this measurement of technology should be heavily scrutinized. One way to ensure accurate representation of technology despite the numerous issues with aggregate analysis techniques is to compare multiple lines of evidence from tools and aggregate/attribute debitage analysis (Andrefsky 2005a; Root 2004).

Sullivan and Rozen (1985) Flake Fragment Typology

While there are numerous attribute analysis methods, those used by Sullivan and Rozen (1985) are likely the most well-known. The original typology has been modified by various researchers over the last several decades (Prentiss 2001; Sullivan 1987; Rozen and Sullivan 1989). Sullivan and Rozen's (1985) interpretation-free typology quickly became a seminal work in debitage analysis by proposing a solution to the critiques leveled against debitage analysis studies (Andrefsky 2005a; Root 2004). These critiques include non-mutually exclusive categories, functional based typologies, and

comparable/quantified categories. Their study proposed four debitage categories (Complete Flake, Broken Flake, Flake Fragment, and Debris) (Figure 12).

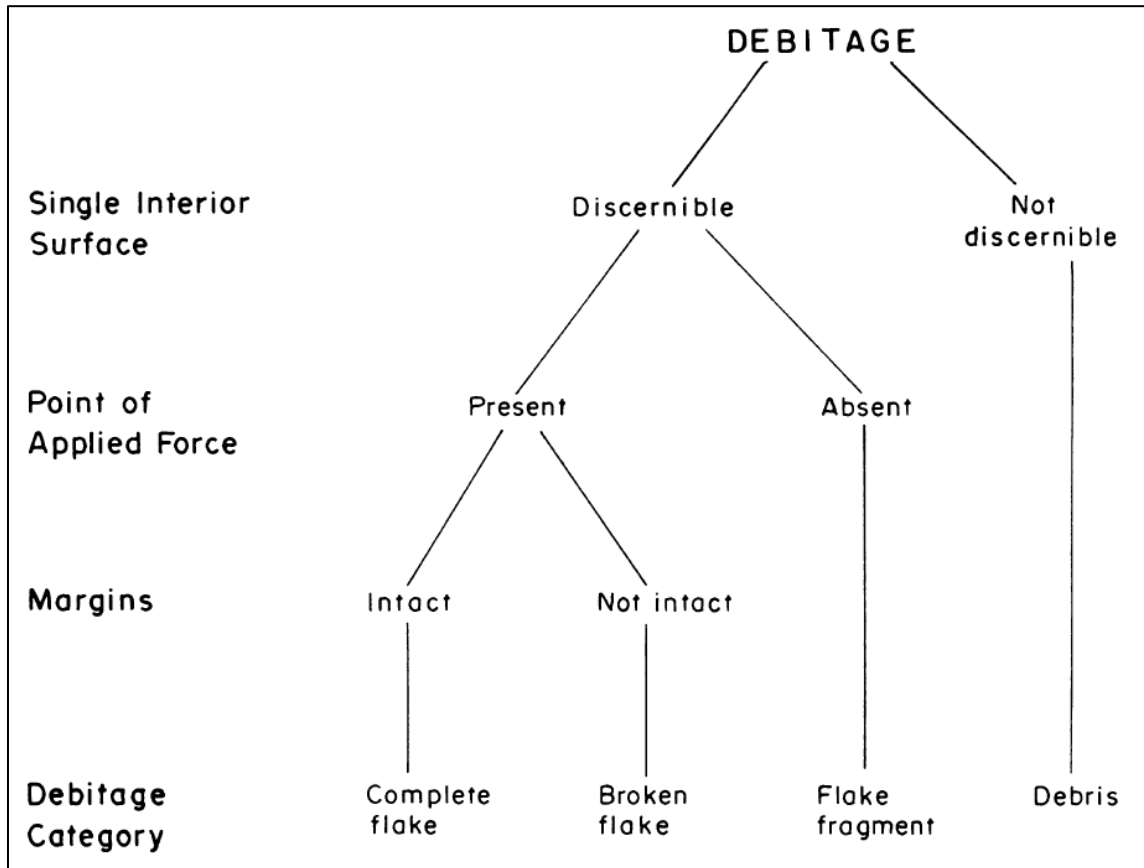


Figure 12. Sullivan and Rozen (1985:759) Typology.

According to Sullivan and Rozen (1985), these attributes are enough to observe technological change over space and time while avoiding the interpretation of the artifact, a common issue in attribute analysis studies (Root 2004). Sullivan and Rozen (1985) determined that a greater frequency of Complete Flakes and Debris would be a result of core reduction, while a greater frequency of Broken Flakes and Flake Fragments would be more representative of tool production strategies. Broken Flakes and Flake Fragments are the result of mechanical failures in thin flakes during reduction (Speth 1972). A high

frequency of Debris was said to be representative of core reduction due to a greater amount of unsuccessful flake detachment attempts creating more debris (Sullivan and Rozen 1985:769).

Numerous authors critiqued the Sullivan and Rozen (1985) typology primarily for its simplicity and lack of tie to experimental studies (Amick and Mauldin 1989, Ensor and Roemer 1989; Prentiss and Romanski 1989). Despite experimental studies being an avenue for archaeological research, the experimental assemblages lack the ability to represent the complexity of the archaeological record (Prentiss 1998; Williams and Andrefsky 2011). Sullivan and Rozen's (1985) typology was championed for being easily replicable and quick (compared to traditional attribute analysis), but ultimately could not stand up to validity testing due to a lack of control over precursor type, nodule size, platform type, and flint knapper skill, all of which cause variation in debitage type frequencies (Prentiss 1993, 1998). Essentially, the classes mask too much variability, forcing core and tool reduction flakes to fall into the same class and effectively invalidating any interpretive value of the typology.

To control for this variation, Prentiss (1998) conducted a series of controlled reductions split into specific technological reduction events using mixed assemblages. These experimental assemblages were subject to reliability and validity testing and the results were used on an archaeological assemblage as a test of the Sullivan and Rozen (1985) typology validity. While found to be highly reliable, the typology failed to meet validity testing. Despite the known and well-studied failures of the Sullivan and Rozen (1985) flake fragment typology to accurately measure production technology in experimental assemblages, Prentiss (1993, 1998, 2001) and Baulmer and Davis (2000)

have shown that, when combined with size classes and experimental reduction assemblages, some macro-scale observations of reduction technology can be accurately and reliably measured.

To increase the validity of the Sullivan and Rozen (1985) typology, Prentiss (1998, 2001) segregated the flake types across four size grades (small, medium, large, and extra-large [Prentiss 2001:148]). In general, Prentiss (1998 and 2001) found that core reduction produced large complete flakes and flake fragments, while tool reduction was noted by a high frequencies of small flake fragments and broken flakes with very low debris (Prentiss 2001:151-154,171). Prentiss' (1998, 2001) method has been successfully employed in several debitage studies to show inter- and intrasite debitage variability (Austin 2015: 418-419; Finley et al. 2005:237-238; MacKay 2008:53-55; Prasciunas 2007:353-356; Willhite 2016:100-102).

The techniques for measuring lithic debitage assemblages discussed above will provide the data to detect technological variability in the Mesa site assemblages, while maintaining comparability to existing studies. However, in order to gain meaning from the data sets, expectations regarding lithic debitage frequency, flake completeness, and flakes size must be laid out. These expectations have been developed through the last 40 years of archaeological research in the Columbia Plateau that culminate in proposed models of pre-contact lifeways. The next section reviews models that have been previously applied to Mesa site occupation in order to establish expectations for lithic assemblages technological and functional variability.

Pre-Contact Settlement Models of the Columbia Plateau Mesas

This section concentrates on answering the following question: how has variability in lithic technology or function fit into proposed settlement models for the mid-Columbia hinterlands compared to Mesa sites? Archaeological land use or settlement prediction models have been developed for the Columbia Plateau ever since large scale archaeological investigation began in the region during the 1960s. Following Dancey's (1973) dissertation, these models primarily concentrate on the comparison of different environmental regions, such as the uplands versus the rivers or the hinterland interior, to understand the movement of pre-contact peoples and their uses of the varied environments in and surrounding the Columbia Plateau. Based on these previous predictions of Columbia Plateau settlement by Dunnell and Dancey (1983) and Ray (1932), specific lithic expectations regarding lithic assemblage technology, function, and style can be made. The following reviews focus on identifying these expectations in settlement models that have been applied to Mesa site occupation (Dancey 1973; Galm 2006; Ray 1932; Smith 1977:12-14).

Dunnell and Dancey (1983)

Dancey's (1973) dissertation provided support for the utility of determining land use and settlement patterns through surface archaeological deposits. His work was a departure from common archaeological practice at the time and sought to use the full spectrum of archaeological materials available in the Columbia Plateau to better understand its pre-contact inhabitants. Dancey (1973) completed collection and analysis of over 13,000 artifacts from five separate landform types that he termed microenvironments. He considered artifacts individually, recording precise locations of

isolated artifacts and clusters to determine the intensity and activities on each separate landform. Based on the relationships between clusters and isolated or intercluster artifacts, Dunnell and Dancey (1983:275-278) suggested that similarities between cluster and non-cluster artifacts are the result of resource acquisition or extraction. Dunnell and Dancey's (1983) model would suggest the Mesa sites should not be viewed as isolated areas of specific activity but instead as an extension of those activities taking place at riverine sites. In this study, the model is applied to consider if riverine occupation clusters at 45DO673 are similar to Mesa site clusters.

As a proof of this concept, Dancey's (1973) central Washington data was directly applied by Dunnell (1978b:62) to test the hypothesis: "sets of functional classes may be expected to correlate directly with microenvironmental classes." Ultimately Dancey's (1973) data and Dunnell's (1978b) application show that a correlation exists between classes of microenvironments and functional artifact types. Specifically, the research demonstrates that because of the direct correlation between microenvironments and functional types, a functional type can be predicted based on the microenvironment being studied (Dunnell 1978b:62). More broadly, the research shows that the correct functional classification (through paradigmatic classification and association with microenvironments) of stone tool assemblages can lead to functional typologies that more accurately represent pre-contact use in conjunction with a specific environment.

More recent work has continued to build on the ideas presented by Dancey (1973) by studying relationships between artifact typological frequencies and their environmental locations (Senn 2007; Woodard 2008). For example, Amy Senn's 2007 thesis found that significant relationships existed between specific lithic artifact types and

microenvironments, while no significant relationship existed between site type frequencies and landforms in the Saddle Mountains. Specific to the lithic assemblages of the Mesa sites under study, Senn (2007) found a significant relationship between artifact frequencies and distances to local tool stone sources. Woodard's (2008) work closely followed that of Dancey (1973) and Senn (2007), testing the relationship between archaeological landforms and the archaeological record. In short, both studies came to the same conclusions as Dancey (1973) and Dunnell (1978); the archaeological record is not randomly distributed across the landscape. Specific to the Mesa sites, Senn (2007) and Woodard (2008) established that a significant relationship exists between the archaeological record and interbedded tool stone sources. Ultimately both authors found that the archaeological record has a significant relationship to certain environments in the Saddle Mountains (Senn 2007; Woodard 2008:94-97). Woodard (2008) found contrasting evidence of artifact and landform relationships when compared to Dancey (1973) although wind-blown silts and low sample sizes may have affected results.

Sanpoil-Nespelem Model

Smith (1977:10-14) used the Sanpoil-Nespelem settlement and subsistence patterns escribed by Ray (1932) to develop a middle-range-theory based interpretive model, for human land use in the Mesa site's hinterland environments over the last 2,000 years. Since then, other authors have reviewed the model (Galm et. al. 1981; Norman 1996) and it has been applied numerous times in Plateau archaeology. The model is based on the ethnographic work of Verne Ray (1932) who spent over two years on the mid-Columbia Plateau with the Sanpoil and Nespelem in the late 1920s. Ray's (1932) informants considered the center of their territory at the confluence of the Sanpoil and

Columbia rivers with knowledge that use of the entire mid-Columbia Plateau occurred throughout the year. Specific to the hinterland Mesa sites, Ray (1932) observed an annual subsistence cycle with winters spent in riverine villages, spring focused on root crops in the steppe, fish camps in the summer along the river, and large game hunting in the fall and winter in the hinterlands and uplands.

Smith's (1977:10-12) Sanpoil-Nespelem model applies theory derived from Binford and Binford (1966) to suggest that permanent (winter) villages would have greater artifact diversity than fishing, hunting, or root gathering camps. Smith (1977:13) suggests that lithic debitage relating to maintenance, defined as "storage processing, and consumption of materials already on hand" at work camps is expected to increase with distance from the "base" winter village. The diversity and level of maintenance of transient camps used in the fall should represent both base and work camps. Ultimately, the Mesa sites studied by Smith (1977:77) are predicted to be transient camp locations with at least Mesa 12 being occupied primarily in the spring (Fitzpatrick 2018:81). To apply new expectations to lithic assemblages, the notion of transient camps needs to be explored further. Smith (1977:13) states that transient camps are "... maintenance activities [that] are concentrated in base camps, whereas extractive activities tend to characterize specialized work camps, such as kill sites, collecting stations, and quarries. Transient camps may combine both types of activities." If the Mesa sites are indeed transient camps, representing activities from both the winter village and work camps of the Sanpoil Nespelem model, then moderate artifact diversity (here defined as evenness) should occur with representation of extractive and maintenance activities. To summarize Smith's (1977:13) interpretation in the context of lithics; if Mesa sites are base camps

then lithic artifact diversity should be high, if they are work camps then lithic artifact diversity should be low.

The following chapter will lay out expectations for lithic technological assemblages based on the proposed models discussed above and detail a method by which to test those expectations.

CHAPTER IV

METHOD AND TECHNIQUE

Chapter IV describes the methods and techniques that are used to assess the proposed research question: how does the frequency of technological and functional traits of lithic stone tools and debitage vary between the microenvironments of riverine occupation site and hinterland Mesa sites? This section addresses thesis Objective 2 from Chapter I: construct a lithic technological model for Mesa sites.

To address Objective 2, a model to detect variation and to identify selective conditions in Mesa site lithic assemblages has been constructed, adapting a model rooted in evolutionary theory used by McCutcheon (1997) (Figure 13). The model breaks down the analytical strategy used by this study to determine how the frequency of technological and functional traits of stone tools and debitage vary across different site selective conditions or microenvironments (Dancey 1973; Senn 2007; Woodard 2008). This model is purposely designed so that it can be used as an analytical strategy to continue the investigation of additional Mesa sites on the Columbia Plateau. If pre-contact peoples use of different microenvironments is reflected in the stone tools they left behind, then those artifacts will not be distributed randomly (Dancey 1973). Thus, if Mesa site use reflects limited activity loci, compared to occupations at riverine dwelling loci, then artifacts types and/or frequencies should be nonrandomly distributed. Nonrandom distribution should occur where use due to differences in selective conditions is represented.

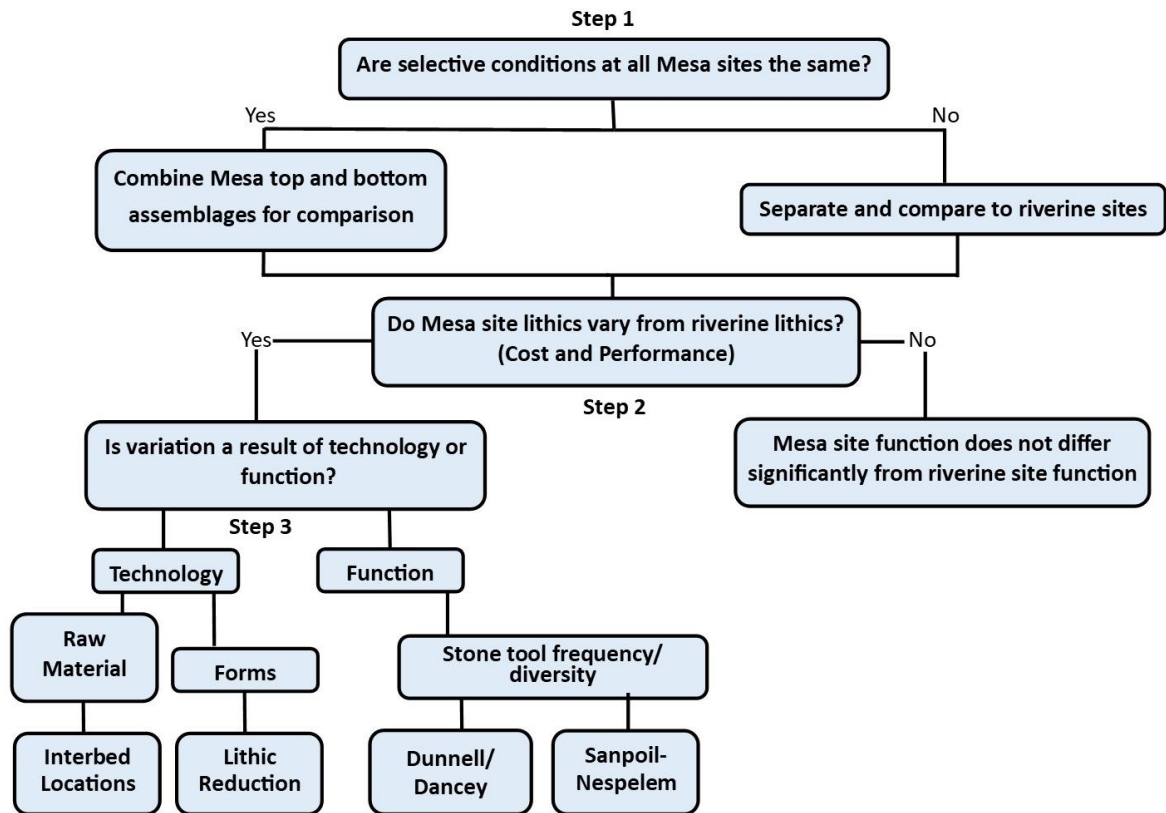


Figure 13. Mesa and Riverine Variability Model.

The first step is to determine if selective conditions at Mesa sites are the same. In this study this step is completed through aggregate comparison of lithic debitage and stone tool types between Mesa sites 06, 12, and 36 provided below in Chapter V. If significant differences occur between Mesa top and bottom assemblages or between the Mesa sites themselves, then they will either be separated or combined for comparison. In the second step the results of lithic technological analysis will be considered under a cost and performance model used in previous Northwest evolutionary archaeological studies of lithic variability (Dyson 2018; Ferry 2015; Kassa and McCutcheon 2016; Lewis 2015; Vaughn 2010). The third step is to determine if the lithic debitage and stone tool frequencies vary between microenvironments. That variation will then be examined as a result of technology or function. This study specifically considers the Sanpoil-Nespelem

model (Ray 1932; Smith 1977:10-14) and Dunnell and Dancey (1983) models to produce expectations for lithic frequencies. Technological expectations are compared against known expectations regarding raw material availability (Andrefsky 1994; Senn 2008; Woodard 2007) and lithic reduction (Andrefsky 2005a; Sullivan and Rozen 1985)

Cost and Performance

A cost and performance model, grounded in evolutionary archaeology theory (Dunnell 1978, 1980), is best suited to address the research questions because the model takes into account the complex relationship between the cost of manufacturing and the performance of using stone tools by highlighting variation between Mesa and riverine stone tool assemblages. The model focuses on the elements of stone tool industries and their interrelationships and how sorting caused by the selective conditions drives variation among hinterland and riverine environments. Stone tool cost is defined as the amount of energy required to reduce the artifact for a specific performance, while performance is the work the stone tool object is doing in the given environment (McCutcheon 1997:191-192). The model functions on the assumption that with all other variables held constant, reduction techniques and stone tool forms that are less costly will persist and outnumber more costly alternatives. Alternatively, if a costly form or reduction technique has a greater value of performance it may be chosen despite its high cost.

One of the more well studied variables related to cost on the Columbia Plateau is distance to raw material (Kassa and McCutcheon 2016; Senn 2007, Woodard 2008); the greater the distance between the source location, and the tool reduction location the more costly it is for a person to acquire it, all other things equal (McCutcheon 1997:193-194).

This cost can be mitigated if the tool stone has a higher performance than more locally available tool stone (Andrefsky 1994; McCutcheon 1997). For the Mesa sites, this idea translates into the expectation; if more locally available chert or basalt was used for stone tool reduction, then the less cost went into the acquisition process. A higher frequency of cores in an assemblage would suggest that a stone tool source location was nearby, given the increased cost of transporting raw material.

Cost can also be measured in tool forms. For example, utilized flake tools are generally expected to be less costly but also have poorer performance. These tools are fast to make and require less energy invested from the user but have a smaller range of potential uses compared to bifacial tools. Bifacial tools are more costly, requiring a higher time investment, but are a more versatile tool with a higher performance value (Andrefsky 2005a). Higher frequencies of finished tools occurring at individual sites would suggest the cost of transporting material to that specific site outweighed any potential performance benefit. Even a basic understanding of stone tool source locations in relation to sites combined with stone tool types can provide data for an explanation of stone tool frequency. The relationships between Mesa sites and riverine sites are then compared to lithic assemblage expectations derived from models of pre-contact Columbia Plateau land use. These expectations, discussed below, are the first step in placing the lithic analysis results into a historical narrative.

Sanpoil-Nespelem

Expectations regarding lithic frequencies and diversity can be derived from the Sanpoil-Nespelem model initially developed by Smith (1977:10-13) to interpret Mesa site results and developed from ethnographic information by Ray (1932) (Table 3). These

expectations are based on an evolutionary archaeological approach to Smith's (1977:10-14) initial model and developed solely for this thesis.

Table 3. Sanpoil-Nespelem Land Use Model Lithic Expectations

Expectation	Stone Tool Diversity	Lithic Technology
Mesa sites are seasonal procurement with riverine villages as semi-permanent long-term occupation sites	Stone tools should be less diverse at Mesa sites than riverine sites	Lithic reduction should be similar between Mesa sites but different between river and mesas

The first expectation is that diversity should decrease away from the riverine occupation sites because the Sanpoil-Nespelem model suggests that the hinterland coulee sites were task-specific locations used in the spring and fall and thereby would be less diverse in stone tool manufacture and use. If specific tasks, such as root gathering or hunting, or a combination of both, were the only activities at the Mesa sites, then stone tool diversity (evenness) should be lower than riverine sites. Task specific sites are likely to require a less diverse range of tool forms than sites where multiple tasks are conducted. For example, a fishing site is likely to have stone tools focused on fishing and fish processing and therefore less diverse than a village. Second, the Mesa sites should have similar lithic technology, as this model suggests that similar limited tasks would have occurred at each site, therefore sharing general lithic reduction strategies between Mesa sites. If the hinterland sites were used primarily for subsistence purposes, such a root gathering or hunting, then they should share the same truncated lithic assemblage when compared to riverine villages where a greater diversity of tasks took place. This model would be reflected by lithic assemblages with higher proportions of broken and

fragmented flakes in smaller size classes, indicating biface production, maintenance, and resharpening (Prentiss 2001). Third, riverine sites should reflect a wide range of reduction strategies and material types compared to Mesa sites if they were indeed winter villages with biannual or annual use. Smith (1977:76-77) suggests that the Mesa sites are transient camps. Several others (e.g. Galm 2006; Kuntz 2009; Lothson 1989) propose functions such as task specific subsistence or short-term hunting camps, generally aligning with Smith's (1977) interpretations.

Dunnell and Dancey (1983)

Dunnell and Dancey's (1983:275) approach would suggest that Mesa sites should not be viewed as isolated areas of specific activities but instead as possible extensions of those activities, a combination of procurement and domestic activities, or locations of completely separate activities. Three expectations can be set forth based on Dunnell and Dancey's (1983) model discussed in Chapter III (Table 4). Table 4 includes which of the four sites adhere to Dunnell and Dancey's (1983) model based on the criteria described below and in Chapter III.

Table 4. Lithic Assemblage Expectations between Microenvironments

Dunnell and Dancey (1983) Model Expectations*	Diversity	Stone Tool Assemblage
1. Mesas and 45DO673 have the same functions	Same or lower diversity score	No significant differences between tool categories
2. Mesa are combination of activities	45DO673 has greater diversity	Significant differences in tool categories
3. Mesas and Riverine have completely separate functions	Mesa sites are more diverse	Significant differences in tool Categories

*Adapted from Dunnell and Dancey (1983:275).

It is possible that the Mesa sites themselves are samples of each other. For example, Mesa 06 could be a procurement location tied to occupation of Mesa 12. Therefore, the lithic assemblage of Mesa 06 would be a sub-sample of the assemblage at Mesa 12 with a higher frequency of early stage core reduction. Additionally, the Mesa sites may vary between themselves within the same environment, acting as staging areas for multiple activities that would be represented in additional, likely less dense sites, in the same microenvironment.

Techniques

Specific techniques and analytical tools are required to successfully answer the research question and hypotheses identified in Chapter I as well as the Mesa site variability model (see Figure 13). These objectives first build a model to answer questions about differences in lithic artifact frequencies across archaeological assemblages. That model is then used to interpret the results of comparisons between three hinterland Mesa sites and a riverine site. Four objectives identified in Chapter I and summarized here to guide the explanation of techniques:

- 1) Objective 1 is to recreate the original data compiled by Smith (1977) so that artifacts can be used in a case study to evaluate a comparative approach;
- 2) Objective 2 is to construct or adapt a cost and performance model that will allow measure of variation tied to selective conditions under which stone tools were manufactured and used (McCutcheon 1997:197);
- 3) For Objective 3; Mass analysis of lithic debitage and tools from Mesa sites 06, 12, and 36 will be conducted to determine basic attributes and coarse-grained lithic technological frequencies within each Mesa site. Statistical

inference is limited to those lithic frequencies that are statistically representative based on resampling curves generated by a bootstrap statistical program (Lewis 2015; Vaughn 2010); and

- 4) Following acceptance or rejection of the null hypothesis (there is no significant variation in lithic technology and function between one riverine and three hinterland Mesa sites) the research question “how does the frequency of technological and functional traits of lithic stone tools and debitage vary between the microenvironments of a riverine occupation site and hinterland Mesa occupation sites” will be addressed. The results will be compared against previous settlement and subsistence models for the mid-Columbia Plateau and Mesa sites.

Collection Rehabilitation

The Mesa Project collection analyzed by Smith (1977) retained enough provenience information to sort and classify most artifacts cataloged in the original field and lab documentation. All artifacts from Mesa sites 06, 12, and 36 were classified into mutually exclusive categories described below and sorted by provenience. The first step of this effort was to sort all artifacts for a site by provenience. The provenience on the bags was then compared to a list of all known features, units, and levels at each site to determine if all units were represented in the collection. After arranging by provenience, each artifact was cataloged with a new sequential catalog number beginning with one. Where present, old catalog numbers were noted on the back of the tags to ensure that the original catalogs could still be used. New catalog information included artifact material/type, count, feature, and unit and level provenience, and original excavator.

This process was completed for all 25,451 artifacts including bone, charcoal, organics, soil samples, and lithics. The lithic categories in Table 5 were used for initial classification, some of which were carried into analysis. The mutually exclusive lithic categories are used for all rehabilitated collections at Central Washington University. Descriptions were added during this study (see Table 5) to make the categories consistent with prevailing lithic technological and functional descriptions (Andrefsky 2005a; McCutcheon 1997). Student lab assistants (Jordan Lancaster, Jackey Anderson, and Nik Simurdak) aided in every step of the process; however, the author reviewed all steps and artifacts. All data was recorded by hand and then entered into an electronic Microsoft AccessTM database, one for each site. Provenience categories vary between sites as different methods were used to record horizontal and vertical locations of artifacts and features at Mesas 06, 36, and 12.

Table 5. Lithic Catalog Categories

Class	Code	Attributes
Lithic Point	LP	Bifacially modified, intact hafted element
Lithic Biface	LB	Two sides forming an objective edge, flaking extending past margins of flake on both sides
Lithic Utilized	LU ^a	Macroscopic (<20x) flaking extends beyond margins on one side or does not extend past the margin on both sides
Lithic Core	LO	Multiple flakes scars originating from multiple directions
Lithic Ground Stone	LG	One or more sides with grinding, polishing, or battering modification
Lithic (unspecified)	L	Non-culturally modified stone
Lithic Debitage	LD	Any stone separated from the objective piece as it is being reduced (Andrefsky 2005a)

^a In the CWU catalog system, LU is an abbreviation for Lithic Uniface

Sample Selection

Smith's (1977:68-74) study of the Mesa sites focused primarily on discovering the function of basalt features and firmly dating the sites. Smith (1977:82) suggested a study with more "sophisticated" artifact classifications with "investigation of non-mesa sites, particularly those located in the Channeled Scablands of the Columbia Basin." Previous studies of variability using evolutionary archaeological theory in the Northwest have cited sample size as a source of nonrandom sorting (Lewis 2015; Vaughn 2010). Initial sample selection focused on examining the entire excavated lithic assemblage from each of the three selected Mesa sites.

The areas of the Mesa site excavated by Smith (1977) were almost solely driven by Mesa geomorphology. The deposition of aeolian soils on the Mesa sites is limited, otherwise the Mesa sites are bare basalt rock. Excavations appear to have taken place in areas where soil deposition occurred in sufficient quantities. These areas (called recoverable surface area) were measured during this study based on aerial photography and maps from Smith (1977). Smith (1977:40,64) excavated a surface area of 226 m² at Mesa 06, 220 m² at Mesa 12 top (515 m² bottom), and 596 m² at Mesa 36. Mesa 12 is the only site with an assemblage at the bottom. Therefore, Smith (1977) tested 12% (28m²) of the recoverable surface area at Mesa 06, 7.2% (16 m²) of Mesa 12 (3.1% (16 m² bottom), and 2.2% (13.5 m²) of Mesa 36. The excavated assemblages account for roughly between two and 12% of the potential recovery area at the Mesa sites. For comparison, Root et al. (2016) excavated 45 m² within the 13,443 m² site boundaries, representing less than one percent of the potential recovery area. Percentage of site area excavated was calculated by dividing the excavated areas (where soil deposition occurs)

within the site boundaries and then dividing by the entire site area. Surface artifacts were collected from the remainder of the site areas but were often not individually mapped. The analyzed sample for this thesis includes surface artifacts. During collection rehabilitation of Mesa sites 12 (45GR144), Mesa 36 (45GR145), and Mesa 06 (45GR162) a total of 15,941 individual lithic artifacts were counted. Those included 532 tools (LB, LP, LO, LU) that were placed into mutually exclusive technological and functional categories defined above. Root et al. (2016) reported a total 3,231 lithic artifacts, 169 of which are tools.

Nonrandom associations can be from a number of sources of sorting, including but not limited to selective conditions. There were 879 lithic artifacts from the three Mesa sites (percent of total counted) that were ultimately eliminated from this study due to provenience issues and difference in initial recovery techniques. Of these 879, 606 pieces of debitage, while likely associated with the Mesa sites, had no indication of which site they were recovered from and research using original project documents was unable to determine provenience. Since this study relies on lithic frequencies to study variability between sites, these artifacts were not included in analysis. Additionally, 273 artifacts at Mesa 12 were not included. Based on unpublished field notes from the Mesa Project and personal communication with Dr. William Smith, Feature 1224 was subject to different recovery methods than the rest of Mesa 12 or the other Mesa sites excavated (Dr. William Smith, personal communication 2019). A review of project field records indicates this feature was excavated in a single five by five-meter area to an unknown depth. These records also indicate that artifacts were handpicked, possibly in addition to screening, therefore skewing the recovery of this feature. Since the following analysis partially

relies on flake size differences between sites, any deviation from the screening methods used in all over locations would likely skew the data at Mesa 12. These artifacts were not included in analysis.

For the same reason, all flakes less than 1/8" in size were eliminated from analysis as these had to be handpicked and not subject to initial in-field sampling. All screens used during excavation likely used 1/4" mesh. Artifacts smaller than 1/8" were often picked up and bagged instead of being discarded. (Dr. William Smith, personal communication 2020). No Mesa site lithic artifacts defined as tools were excluded from analysis.

Mesa 12 is immediately unique among the Mesa sites in this study as it has artifact concentrations on the top and at the bottom of the Mesa. Excavation area 1201 is located at the base of Mesa 12 on the southern side as described in Chapter III. To account for differences that may occur between the top and the bottom of the Mesa sites and to make Mesa 06 and Mesa 36 comparable to Mesa 12, Area 1201 was split out during analysis. The percentages of object types, flake size, and flake types were compared between the top and bottom lithic assemblage of Mesa 12. If significant differences occur between the two areas, then the bottom is split and analyzed separately. By separating the two site areas we may be able to determine if specific selective conditions between Mesa top and bottoms are affecting past people's choices in regard to lithic technology and function.

Tool classes used in the previous analysis of 45DO673 by Root et al. (2016) were divided by much more specific attributes than the generalized technological/functional classes used in this study. However, tool classes are well defined and were consolidated

into the four tool (LB, LP, LO, LU) classes used at the Mesa sites. At the riverine site 45DO673, the drill class (n=1) was defined as both patterned flake tools and bifacial tools and therefore it was excluded from analysis. Utilized flakes (LU) includes the Root et al. (2016) functional categories of flake tools, retouched flakes, perforators, gravers, burins, wedges, notched flakes, scrapers, and knives as these categories share the attributes of the LU category as defined above. Root et al. (2016) defined cores, ground stone, projectile points and bifaces using common terminology and attributes (Andrefsky 2005a) and therefore these artifact classes could be directly compared against those used for the Mesa sites.

Aggregate Size-Class Analysis

Size class sorting was completed using VMR brand stainless-steel nested sieves with square openings. All artifacts were either gently hand manipulated or poured through each sieve using cardboard placed in the stainless-steel bottom of the sieve stack below the smallest screen to avoid flake damage during sorting. Debitage was sorted by size class then counted and weighed by those sizes. After the debitage was bagged by size class it was further divided based on the flake completeness categories discussed below. Curation of debitage retained the analysis division packaging to aid future researchers interested in the approach used in this study.

Nested sieve screen sizes matched those used during analysis of 45DO673 (Root et al. 2016). Root et al.'s (2016) study used metric-sized nesting sieves. The author had access to nesting sieves with mesh screens in US Standard measurements. Therefore, Root et al.'s (2016) data was reported in metric and converted to square inches to allow

for comparison with the Mesa sites. The same sizes are used in both the current study and Root et al. (2016). Size classes are displayed in Table 6.

Table 6. Size Classes

Classes	Size (inches)	Metric (cm)
	Current Study	Root et al. 2016
Size Class 1	>1"	>2.54
Size Class 2	>1/2"	>1.27
Size Class 3	>1/4"	>0.635
Size Class 4	>1/8"	>0.317
Size Class 5	<1/8"	<0.317

One-quarter-inch screens were used during excavations of the Mesa sites (Dr. William Smith, personal communication 2020); however, a larger number of less than 1/4" flakes were obvious during collection rehabilitation, so smaller sizes classes were added to accommodate the assemblages. Excavations at 45DO673 used 1/8" screen and size class analysis in Root et al. (2016) either did not measure less than 1/8" flakes, or none were located during analysis.

Flake Completeness Analysis

Following aggregate sorting by size class, Sullivan and Rozen's (1985) typology was used to sort debitage by completeness. As discussed in the above chapter, the typology includes four classes: complete flakes; broken flakes; flake fragments; and debris. Each flake was examined individually and placed in one of the four classes based on the attributes in Figure 12. Two laboratory assistants (Jackey Anderson and Nik Simurdak/Harkins) aided in sorting and analysis of flakes. The author verified each flake for quality control.

Stone Tool Analysis

Analysis of stone tool artifacts followed standards found in Adams (2002), Andrefsky (2005a), Carter (2016), and McCutcheon (1997). Five mutually exclusive categories were used: Projectile Point/Hafted Biface (LP); Biface (LB); Lithic Utilized (LU); Core (LO); and Ground Stone (LG). The lithic utilized category included all artifacts with modification on their edges that were the result of flaking for edge modification (e.g., retouch) distinguished from chipping-type wear that also modifies flake edges (Andrefsky 2005a: 79). Where edge modification was noted, it was differentiated from use wear at 20x magnification, with a binocular dissecting microscope. Use wear was distinguished from edge modification by the presence of five or more contiguous flake scars that were confined to the angular plane where ventral and dorsal flakes sides meet (McCutcheon 1997:238-242). Bifaces were restricted to artifacts where flaking modification extended beyond the margins on both sides of the artifact. The category of projectile point/hafted biface is solely based on commonly accepted morphological characters and is not used to imply function (Andrefsky 2005a:180). For this reason, the projectile point category only contained hafted bifaces with intact haft elements. Ground stone included all artifacts that were “primarily manufactured through abrasion, polish, or impaction” (Adams 2002:1). This category also included those artifacts that were used for “abrasion, polish, or battering” (Adams 2002:1).

Chronological Control

In addition to lithic data, faunal samples submitted for bone collagen radiocarbon assay to determine if chronological control over Mesa sites by AMS is similar to the dates acquired by beta decay of mass charcoal samples. Since the objective of this study

is to measure variation across microenvironments instead of through time, changes in technology and function through time must be acknowledged as potential sources of difference between different aged assemblages. The additional data provided through AMS bone collagen dating will verify the already existing dates collected by Smith (1977:67). Root et al. (2016) collected and submitted bone collagen samples for dating purposes, making dates from 45DO673 directly comparable to the newly submitted Mesa site samples.

Radiocarbon dates were calibrated at 2 sigma (σ) with CALIB 7.1 program (Stuiver and Reimer 1993) using the Intcal13 Atmospheric Calibration Curve (Reimer et. 2013). Since Smith (1977:67) published error ranges for each date these were also calibrated so they were directly comparable against new radiocarbon date ranges. The method available to Smith (1977) used conventional radiocarbon analysis with bulk samples of charcoal, which may combine multiple death events as it is not known whether the charcoal was from old or new wood and/or more than one species of plant. AMS radiocarbon dating techniques for bone collagen, dates when the animal died and allows samples to be taken from a single individual (Chatters et al. 2017). While the AMS technique avoids problems of bulk charcoal samples, one must carefully choose the bone sample to insure they were likely used by past people.

Statistical Tests

Each data set will be subject to a bootstrap test to first determine if the data sets are a representative sample. The null hypotheses presented in Chapter V are addressed through statistical analysis using a non-parametric chi-square test. Each data set will be subject to a chi-square test and displayed using a contingency table format including an

analysis of adjusted residuals. A Cramer's V test will then be used to judge the strength of each test. Results of all statistical tests are included in Appendix A.

Chi-square Test

The chi-square test determines if certain variables (size grades, flakes types, etc.) are randomly associated across Mesa sites by comparing distributions (Vanpool and Leonard 2011:242). For example, when comparing the distribution of observed and expected values of Size Class 1 and Size Class 2debitage between Mesa 06 and Mesa 12 the test results will indicate if nonrandom associations across Mesa sites are present.

The test does not require data to be normally distributed and is common to archaeological applications given that frequencies within classes (e.g., sizes grades, flakes types, etc.) limits analysis to nominal data (Drennan 2009:182-187). Although the test is considered weaker than other non-parametric options, it is the best option to determine statistical significance for the collected data. Most importantly, the chi-square test does not require that sample sizes are equal, a useful point when comparing large archaeological assemblages between sites (Drennan 2009, McGrew et al 2014:187-189).

The chi-square statistic compares the distributions of observed and expected frequencies across the tested variables (Vanpool and Leonard 2011:242). Observed frequency is something you measure whereas the expected frequency is relative to the observed frequencies and is calculated by dividing the observed frequency by the number of categories (McGrew et al. 2014:187-189).

The results of chi-square tests are presented as contingency tables to display the changes in observed versus expected frequencies. The purpose of these tables is to clearly highlight the relationships between individual cells (McGrew et al. 2014). In this

study the relationships between artifact classifications and individual sites are displayed. Each table is followed by the overall chi-square statistical result, confidence level, and degrees of freedom.

Standardized/Adjusted Residuals

Standardized residuals are a measurement of the difference between observed, expected, and the standard deviation (McGrew et al 2014). Adjusted residuals are adjusted for the number of rows and columns used in the test. At a 95th percentile confidence level, 95% of the values are within the mean at plus or minus two standard deviations. Therefore, those cells contribute more to the significant chi-square statistic. For example, if a test indicates that Lithic Cores frequency has a significantly different distribution between a hinterland sites and a riverine site then that difference is an indication of variation in frequency of artifact types between microenvironments. Those significant distributions can then be discussed in the context of the selective conditions that may be present in a given microenvironment. Nonrandom associations can be from a number of sources of sorting, including but not limited to selective conditions.

Cramer's V

The Cramer's V test is used to measure the strength of association between variables. The resulting statistic ranges between 0 and 1.0, 0 being no relationship and 1.0 being an extremely strong relationship. The levels of association in Table 7 follow Le Roy and Corbett (2012).

Table 7. Cramer's V Levels of Association

Level of Association	Strength of Association
0.00-0.25	Very Weak
0.25-0.34	Weak
0.35-0.39	Moderate
>0.40	Strong

Testing Representativeness-Bootstrapping

A method of bootstrapping is used to determine if a sample is large enough to reflect the diversity of the background population. Bootstrapping uses a single sample and treats it like a limited population from which to draw additional samples with replacement (Cochrane 2002:838; Lipo et al 1997). Drawing samples with replacement simply means that once a particular sample is selected it is replaced into the population so that it may be selected more than once. This technique has been employed by the studies reviewed above and follows several established parameters defined in them (Cochrane 2002; Lewis 2015; Vaughn 2010).

This method is conducted using a computer-based program called *Resampler* (Mohr et al. n.d.). The program divides the original sample (now treated as a population) into even increments. For example, for Mesa 36 debitage size class data, the entire sample was divided into increments of 45 based on the default program setting of dividing the entire assemblage by 50. At each of those increments a selection of individuals (in this case debitage or stone tools) is drawn relative to the sample size entered. This process is repeated 1,000 times for each increment. This is repeated for each addition increment recording the mean, standard deviation, standard error, median, minimum, and maximum richness for each increment. The mean richness and variance

(measured by the standard deviation) of each increment is then plotted on a graph and a curve drawn from each plot.

A sample is considered representative when the curve (mean and variance) reaches the asymptote (where the slope of the line is zero). However, where the asymptote occurs in the resampling process and how it relates to representativeness of an archaeological sample has been debated (Cochrane 2002). For this application, the standards for measuring sample representativeness given below follow previous archaeological applications in the Northwest, primarily Lewis (2015) and Vaughn (2010). If the curve does not reach standard deviation of zero (represented by flattening of the curve) then the sample is not considered representative of the background population, thus the conclusions made from the sample are less definitive.

Representativeness is measured by Rank 1, 2, or 3 curves (Cochrane 2002:838; Lipo et al. 1997:316) (Figure 14). Rank 1 curves reach the asymptote with a standard deviation of zero before 75% of the maximum sample size has been resampled. The 75% cut off for Rank 1 curves are based on natural breaks observed in the data by previous studies (Lewis 2015:60; Vaughn 2010:57). Rank 1 curves are considered to show that the sample is representative, indicating that frequencies are evenly distributed across the given classes. Rank 2 curves obtain a zero slope after 75% of the maximum sample, indicating that the samples may have higher richness with uneven distributions (Cochrane 2002). Previous recent studies have considered this curves representative based on their similarity to Rank 1 curves. Rank 3 curves never reach the asymptote and have uneven distributions no matter the degree of richness. Previous authors have considered samples

with Rank 3 curves to be unrepresentative (Cochrane 2002; Lewis 2015; Lipo et al. 1997; McCutcheon 1997).

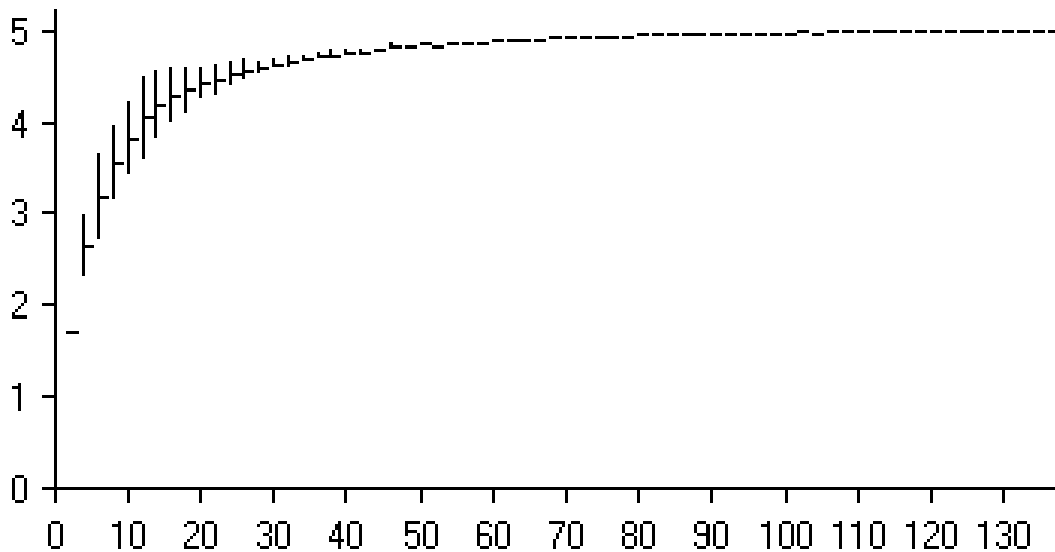


Figure 14. Example of Rank 1 Curve from Mesa 36.

Quality Control

Quality control was provided by Dr. Patrick McCutcheon for a sample of all identified artifacts. A 15% sample was randomly selected from all lithic tools in the collection using a random number generator. These artifacts were reviewed by Dr. McCutcheon and any inconsistencies between the authors' classifications and Dr. McCutcheon's were corrected. The attribute or classification that had the highest error rate was checked by the author on all other artifacts in each of the three collections and updated to reflect the corrections. For example, the most frequent errors in classification occurred in the Lithic Utilized and Lithic Cores categories. Therefore, every tool classified as these types in each collection was reexamined to check for any identification errors. Any errors were then corrected, and the database updated to reflect the

corrections. Table 8 displays error rates for each of the three collections during final quality control.

Table 8. Quality Control

Site	No. of Reviewed Artifacts	No. Corrected Artifacts	Error Rate (%)
Mesa 12	40	6	15%
Mesa 36	20	2	10%
Mesa 06	20	2	10%

The method and techniques discussed above are applied to the gathered data in the following chapter. The model developed above serves to give a consistent approach for comparing lithic assemblages from hinterland Mesa sites to riverine occupation sites. By consistently comparing sites across microenvironments the selective conditions which affected people's choices may be identified in lithic assemblages. The following chapters present a case study and application of this model to serve as a starting point for further investigation into Mesa site relationships on the Columbia Plateau.

CHAPTER V

RESULTS

The following sections fulfill Objective 3 of this thesis which is to test the hypothesis: does the frequency of technological and functional traits of lithic stone tools and debitage vary between the microenvironments of a riverine occupation site and hinterland Mesa occupation sites? This chapter details the results of a case study using aggregate debitage analysis, flake type completeness, and stone tool analysis from all three Mesa sites compared to 45DO673, a riverine site. The following analysis serves to illustrate the type of approach needed to address questions regarding lithic technology at the Mesa sites. Several limiting factors, including the limited previous work at the Mesa sites, are discussed in detail below. These results serve as a jumping off point for more detailed study, identifying presence or absence of variation between Mesa and riverine lithic assemblages and identifying potential selective conditions. Appendix B contains artifact analysis catalogs for reference. The following results are not used to infer specific reduction technologies and instead are used to apply the model described in Chapter IV to a case study that examines technological variability in flake size, flake type, and object type as well as functional variability through tool type comparisons. Results from radiocarbon dates and temporally diagnostic artifacts are presented to further refine chronological control. Each data set is examined following the model shown in Figure 12. Percentages of artifacts from each data set are shown along with a ranked resampling curve and then the significance of the differing distributions is tested through chi-square.

Sources of Nonrandom Sorting

The first step in an evolutionary archaeology approach is to determine if post-depositional sources of sorting (e.g., bioturbation, recovery, sample size, etc.) have yielded biased samples so that we do not mistakenly attribute those sources to stone tool manufacture and use (O'Brien and Lyman 2000). As part of using an evolutionary theoretical framework, the sources of nonrandom variation must be acknowledged so that the remaining variation may be linked to changes in the frequency of technological and functional traits between microenvironments. Five potential sources of nonrandom sorting are present: post-depositional processes, initial in-field recovery techniques, sample size, the chosen stone tool analysis categories, and the difference in occupation dates between the Mesa sites and 45DO673. The final source of nonrandom sourcing is the differences in stone tool manufacture and use as a result to past peoples' choices under different selective conditions which will be addressed in the following results.

Initial sampling of the Mesa sites used 1/4" mesh screen (Dr. William Smith, personal communication 2020). However, 6,779 flakes were identified during size grade analysis that were less than 1/4" in size. This suggests that field crews either selectively picked flakes from the soil surface (during recovery) and dirt in the screen or that 1/8" screen was used during excavation.

Excavated volumes were not consistent across the Mesa sites (Table 9). The differences in excavated volumes are an effect of the erosional environment of the Mesa sites. Soil collects in low places where wind and rain do not scour it off the exposed basalt surface.

Table 9. Excavated Volumes and Lithic Artifact Counts

Site	Excavated Volume (m ³)	Lithic Artifacts Counts
Mesa 06	5.2	7,474
Mesa 12 (Bottom)	4.2	2,448
Mesa 12 (Top)	2.1	4,192
Mesa 36	11.3	2,965
45DO673	42.6	3,307

Therefore, excavations are limited to those areas where soil is present, which varies between individual sites. Furthermore, the amount of total area excavated out of the potential excavatable area ranged from 2.2% at Mesa 36 to 12% at Mesa 06. The differences in excavated volumes may affect results.

Excavations at 45DO673 were far more extensive as the site has more than double the horizontal footprint of any Mesa site. The differences in the excavated volumes may be a source of nonrandom variation. However, frequencies in artifact types across all four sites are high enough that any differences made by excavated volume will not be solely responsible for variation between sites.

The stone tool categories chosen for this thesis are intentionally broad. The broad categories allowed all of the excavated lithic assemblage to be processed in a reasonable time frame for this project while still capturing important initial data regarding stone tool technology and function. For example, chopping tools at Mesa 12 described by Smith (1977:50-51) and noted at other Mesa sites (Galm 2006), fall into the Lithic Utilized category. However, these artifacts are unique to Mesa 12, suggesting that further variability exists that is being hidden by the broad artifact categories.

The last potential source of nonrandom sorting is the chronological differences between the hinterland Mesa and riverine occupation sites included in this study. The

Mesa sites, as reported by Smith (1977:67), were occupied in the Cayuse Phase while 45DO673 was occupied in the Frenchman Springs Phase. At best, these sites were occupied 2,000 years apart (see Chronological Control below).

While the sources of nonrandom variation discussed above may cause significant variation, this case study was far more limited by the availability of comparative information. The other sources of nonrandom sorting (chronological differences, post-depositional processes, initial in-field recovery techniques, sample size) are not discounted but are less likely to affect the data presented below than the methodological issues discussed above.

Chronological Control

By the 1970s, the previous Mesa site research (Caldwell and Coulson 1954; Clinehens 1961; Osborn 1967; Smith 1910; Swanson 1962) had established that the Mesa sites of the Columbia Plateau were used in the Late Archaic (2000 BP-250 BP) and possibly during the Historic period. The chronological placement of Mesa sites in general relied on diagnostic artifact typologies and relative dating techniques. It was not until Smith's (1977) report and later work at Mesa 18 (Galm 2006) that Mesa site occupations were absolute dated to between 300 and 2000 BP. The following sections further resolve temporally diagnostic artifact typologies at Mesa 06, 12, and 36 and present the results of AMS radiocarbon analysis using bone collagen.

Radiocarbon

Smith (1977:67) reported 12 radiocarbon assays taken from bulk carbon during the Mesa Project excavations. These dates were initially reported as un-calibrated BP ranges as was standard at the time (Table 10). To make the original dates as comparable

as possible to the newly submitted bone collagen dates, Smith's original dates were calibrated using the program CALIB and the IntCal13 Atmospheric Curve (Reimer et al. 2013). Smith (1977:67) concluded that Mesas 06, 12, and 36 were occupied intermittently during the last 2,000 years. No correction for isotopic fractionation was given by Teledyne Isotopes and is therefore not included in Table 10. Mesa 12 has the oldest calibrated age. Additionally, the only sample (I-7735) with a reported age range within the Frenchman Springs cultural phase is from the Mesa 12 Bottom (Area 1201).

Table 10. Newly Calibrated Mesa Radiocarbon dates.

Site #	Cat. No.	Provenience	Sample ID	Material	BP	cal BP	2 σ Probability	Cultural Phase
Mesa 06	N/A	06082602	I-9436	Bulk Charcoal	305 \pm 75	268-509	$p=0.9$	Cayuse
Mesa 06	N/A	06082602	I-9437	Bulk Charcoal	220 \pm 115	1-466	$p=1$	Cayuse
Mesa 06	N/A	06082602	I-9438	Bulk Charcoal	615 \pm 145	418-799	$p=0.996$	Cayuse
Mesa 12	N/A	120106	I-7735	Bulk Charcoal	2070 \pm 90	1865-2309	$p=1$	Frenchman Springs
Mesa 12	N/A	120116	I-7736	Bulk Charcoal	1100 \pm 90	899-1188	$p=0.89$	Cayuse
Mesa 12	N/A	120119	I-7737	Bulk Charcoal	1230 \pm 95	961-1301	$p=1$	Cayuse
Mesa 12	N/A	122101	I-7738	Bulk Charcoal	<180 ^a	N/A	N/A	Cayuse
Mesa 12	N/A	122602	I-7739	Bulk Charcoal	565 \pm 80	489-676	$p=1$	Cayuse
Mesa 12	N/A	12260401	I-7750	Bulk Charcoal	1240 \pm 80	1043-1295	$p=0.916$	Cayuse
Mesa 12	N/A	12260402	I-7749	Bulk Charcoal	1605 \pm 90	1326-1703	$p=1$	Cayuse
Mesa 36	N/A	360502	I-7751	Bulk Charcoal	1015 \pm 90	734-1090	$p=0.916$	Cayuse
Mesa 36	N/A	360503	I-7752	Bulk Charcoal	945 \pm 80	692-982	$p=0.995$	Cayuse

^aLab dates and raw ages from Smith's (1977:67) published table are based on Teledyne Isotopes' laboratory data records. Note that the date used here was reported incorrectly in Smith (1977:67, radiocarbon date table).

Three bone collagen dates were submitted during this study for two reasons: first, to check the original dates given by Smith (1977:67) using new technology and techniques not available in the 1970s and second, to have dated bone collagen for comparison against Root et al. (2016) who submitted bone collagen samples for dating, not charcoal. All of the original un-calibrated dates fall within the calibrated ranges. The newly acquired dates show the same patterns as the dates gathered by Smith (1977:67) and all fall within range of the Cayuse Phase. Based on the newly submitted dates, occupations at Mesas 36 and 12 overlap each other while occupation at Mesa 06 likely occurred several centuries later (Table 11).

Table 11. New Bone Collagen Mesa Radiocarbon Dates

Site #	Cat. No.	Provenience	Sample ID	Material	BP	cal BP	2 σ Probability	Cultural Phase
Mesa 06	410	Feature 6082602 10-20 cmbs	D-AMS 033686	Bone Collagen	350 \pm 26	315-410	$p=0.565$	Cayuse
Mesa 12	1309	122604 0-10cmbs	D-AMS 033687	Bone Collagen	919 \pm 26	781-920	$p=0.996$	Cayuse
Mesa 36	420	361203 20-30cmbs	D-AMS 033688	Bone Collagen	1048 \pm 29	934-1013	$p=0.690$	Cayuse

Root et al. (2016) reported eight bone collagen dates calibrated at 2 σ with the program OxCal v4.2.4. (Bronk and Lee 2013). All of these dates fall well within the Frenchman Springs Phase (Table 12). Occupation of 45DO673 appears to have occurred in a smaller time frame than the Mesa sites. Calibrated ranges at 45DO673 span 640 years while ranges at the Mesa sites collectively span 1800 years. Of the three Mesa sites, Mesa 12 would be expected to have the most similar diagnostic projectile points to 45DO673 considering it is the only Mesa site with a date range extending to the Frenchman Springs phase.

Table 12. Calibrated Bone Collagen Dates Reported by Root et al. (2016:80-82).

Site #	Cat. No.	Provenience	Sample ID	Material	BP	cal BP	2 σ Probability	Cultural Phase
45DO673	327	XU34, 40–50 cm	PRI-5314	Bone Collagen	4222 \pm 25	4860–4800	$p=0.509$	Frenchman Springs
45DO673	338	XU34, 66 cm,	PRI-5316	Bone Collagen	4276 \pm 25	4870–4820	$p=0.954$	Frenchman Springs
45DO673	342	XU34, 70–80 cm,	PRI-5315	Bone Collagen	4141 \pm 29	4830–4570	$p=0.955$	Frenchman Springs
45DO673	360	XU38, 30–40 cm,	PRI-5317	Bone Collagen	4200 \pm 26	4770–4620	$p=0.679$	Frenchman Springs
45DO673	382	XU38, 65 cm	PRI-5318	Bone Collagen	4048 \pm 33	4620–4420	$p=0.907$	Frenchman Springs
45DO673	388	XU38, 70–80 cm	PRI-5319	Bone Collagen	4125 \pm 27	4730–4530	$p=0.692$	Frenchman Springs
45DO673	465	XU41, 80–90 cm	PRI-5313	Bone Collagen	3950 \pm 43	4530–4240	$p=0.955$	Frenchman Springs
45DO673	455	XU46, 10–20 cm	PRI-5320	Bone Collagen	3901 \pm 50	4440–4220	$p=0.869$	Frenchman Springs

Projectile Points

Ninety-six projectile points were recovered during initial excavation of the Mesa sites. Six of these were not relocated during analysis and are cataloged as missing (Appendix A). A total of 90 projectile points (21 from Mesa 06; 40 from Mesa 12; and 31 from Mesa 36) were analyzed using the Carter (2016) key and my own visual comparison (Figure 15, Table 13, Appendix B).



Figure 15. Example of Projectile Points from Mesa 36.

Six points from Mesa 12 were not identifiable with Carter's (2016) key, but were intact enough to visually identify: Columbia Corner Notched A (n=2), Columbia Stemmed (n=2), Columbia Corner Notched B (n=1), and Cold Springs Side Notched (n=1). Sixteen projectile points were too fragmented for identification to confidently identify via visual comparison or through Carter (2016). Culture history phases were assigned using the cultural historical periods described in Chapter II.

Table 13. Typeable Projectile Points from Mesas 06, 12, 36 and 45DO673.

Site	Type	Number	Phase	Years BP
Mesa 36	Columbia Corner Notched B	7	Cayuse	2500-250
Mesa 36	Columbia Stemmed	2	Cayuse	2500-250
Mesa 36	Plateau Side Notched	1	Cayuse	2500-250
Mesa 36	Out of Key	6	N/A	N/A
Mesa 12	Columbia Corner Notched A	5	Frenchmen Springs	4500-2500
Mesa 12	Columbia Corner Notched B	8	Cayuse	2500-250
Mesa 12	Rabbit Island Stemmed	2	Frenchmen Springs	4500-2500
Mesa 12	Plateau Side Notched	4	Cayuse	2500-250
Mesa 12	Columbia Stemmed	1	Cayuse	2500-250
Mesa 12	Wallula Rectangular Stemmed	1	Cayuse	2500-250
Mesa 12	Out of Key	2	N/A	N/A
Mesa 12	Cold Springs Side Notch	1	Frenchman Springs	4500-2500
Mesa 06	Columbia Corner Notched B	2	Cayuse	2500-250
Mesa 06	Plateau Side Notched	1	Cayuse	2500-250
Mesa 06	Cold Springs	1	Vantage	8000-4500
Mesa 06	Mahkin Shouldered	1	Vantage	8000-4500
Mesa 06	Out of Key	1	N/A	N/A
45DO673	Rabbit Island Stemmed	2	Frenchmen Springs	4500-2500

Radiocarbon results from this study and Smith (1977:67) place occupation of the Mesa sites within the last two thousand years. Based solely on projectile point forms, the range of occupation for all three Mesa sites is primarily within the Cayuse Phase (2,500-250 BP). Of the 81 keyed projectile points at the Mesa sites there are eight different types. One Cold Springs Side Notched and one Mahkin Shouldered point (both Vantage Phase) were located at Mesa 06, suggesting an earlier use of the site that is not reflected in the radiocarbon results. All projectile points at Mesa 36 are associated with the Cayuse Phase, making a multiple phase occupation at Mesa 36 unlikely.

Fourteen of the 24 typable projectile points at Mesa 12 are associated with Cayuse Phase occupations, while eight are associated with the Frenchman Springs Phase and two are out of key. The presence of Frenchman Springs phase projectile points are expected at Mesa 12 considering that Mesa 12 is the only Mesa site with a radiocarbon date range extending to the Frenchman Springs phase (Sample ID: I-7735 1865-2309 cal BP). Twenty-seven of the 40 (including the 16 which were too fragmented for identification) projectile points at Mesa 12 were recovered from the bottom excavation area (1201). Five of the eight Frenchman Springs phase points were located at the bottom (Area 1201) where the Frenchman Springs dated radiocarbon sample was taken. Eight points from Area 1201 are associated with the Cayuse Phase while the remaining are out of key or were too fragmented to identify. This suggests a tentative chronological difference between the top and bottom of Mesa 12. Area 1201 has an even representation of Frenchman Springs and Cayuse projectile points and a radiocarbon assay date from the Frenchman Springs Phase. These data indicate either a Frenchman Springs occupation at Area 1201 or continuous occupation through both phases. If the debitage and stone data below continue to reflect differences between the top and bottom of Mesa 12 then age difference between the two locations should be considered a likely source of nonrandom sorting. It is also possible that Area 1201 at Mesa 12 may share more lithic attributes with 45DO673 than the rest of Mesa 12 and the other Mesa sites, suggesting 45DO673 was not only occupied during the same time period but shared activity types as well.

Eight projectile points were recovered from 45DO673; however, six of those were too fragmented to visually type (Root et al. 2016:107). Of these eight points, two were visually identified as Rabbit Island Stemmed forms belonging to the Frenchman Springs

phase. Root et al. (2016) did not use the Carter (2016) key. The chronological differences between sites based on radiocarbon and projectile point forms will be considered in Chapter VI alongside the lithic analysis results.

Lithic Analysis Results

A total of 15,640 flakes were individually examined from Mesa 06, 12, and 36. The following sections are organized to first test the null hypothesis that there is no significant difference between technological and functional variation in lithic assemblages between individual Mesa sites. Then secondly to test the null hypothesis that there are no technological and functional differences between hinterland Mesa sites and a riverine occupation site.

Debitage Size Class

Following the model described in Chapter III, the top and bottom components of Mesa 12 are first separated and compared to look for any variation acrossdebitage size classes (Figure 16). As a reminder, Size Class 1= $\geq 1''$, Size Class 2= $\geq 1/2''$, Size Class 3= $\geq 1/4''$, Size Class 4= $\geq 1/8''$, Size Class 5= $\leq 1/8''$

Figure 17 depicts the distribution of flakes across all four size grades by percentage count. Size Class 5 was dropped due to sampling issues described in Chapter IV. The distribution of size classes from Mesa 06, Mesa 12, and 45DO673 are assigned Rank 1 sampling curves, indicating that the samples are representative. Size classes from Mesa 36 are assigned a Rank 3 sampling curve, indicating that the sample is not representative. Inferences regarding Mesa 36 size classes are suggestive and less certain than those from the other assemblages.

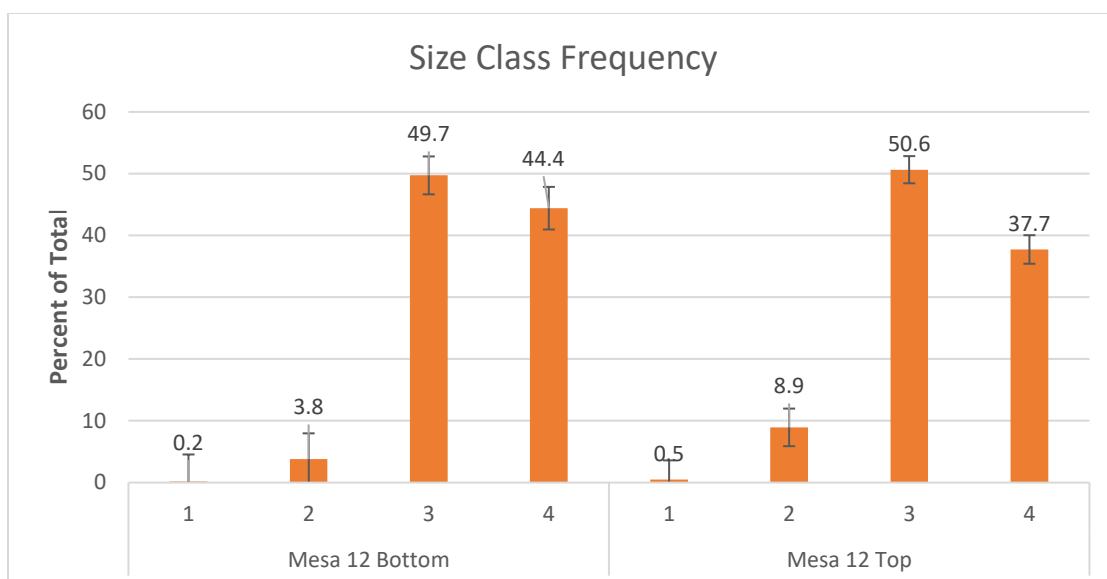


Figure 16. Debitage Frequency by Size Class Mesa 12 Top and Mesa 12 Bottom.
(Bar label numbers are the percent of total debitage by size class.)

While minor differences are present, the general trends remain the same between the top and bottom assemblages of Mesa 12. Size Classes 1 and 2 make up less than 10% of both assemblages. The most flakes occur in Size Class 3 followed closely by Size Class 4. Due to the similarities in size class distribution, the debitage from Mesa 12 top and bottom assemblages will be combined for comparison to 45DO673. As discussed above, Mesa 06 and Mesa 36 do not have assemblages below the Mesa top.

When all four sites are compared together, Size Class 1 makes up less than 1% of the assemblages. Size Class 2 represents between 5.4% and 7.6% of assemblages. Size Class 3 at the Mesa sites ranges between 44.3% and 51.2% while Size Class 4 varies from 39.7% to 46.6%. The 45DO673 lithic assemblage has over 70% in Size Class 4 or less than 1/4" in size. Size Class 3 at 45DO673 (n=22.5%) is around half of all three Mesa sites. Size Classes 1 and 2 falls between 0.4% and 3.6%, a similar range to the Mesa sites. Overall, the Mesa sites have the same general distribution of debitage over the size classes while 45DO673 is different.

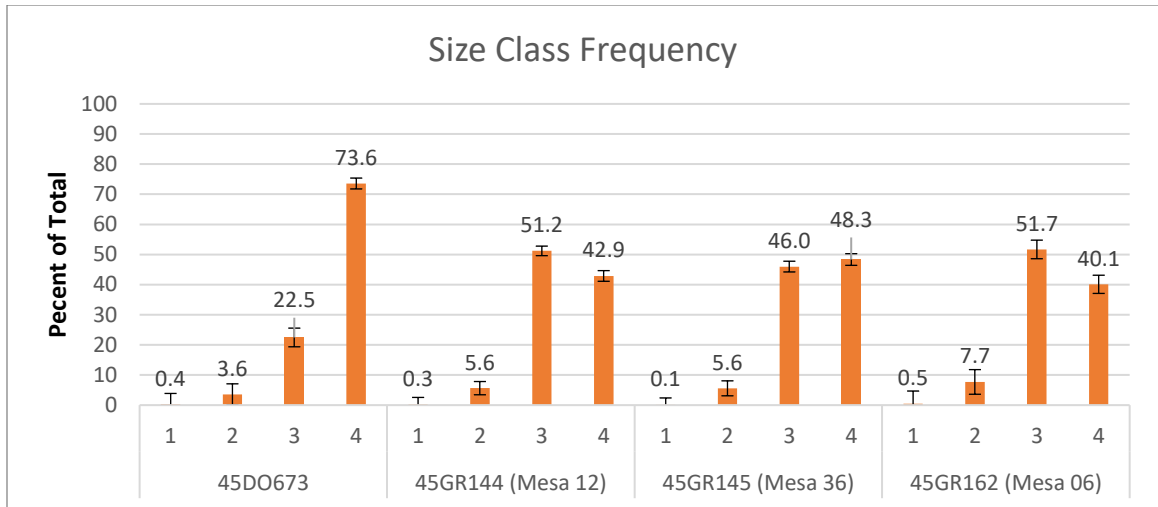


Figure 17. Debitage Frequency by Size Class across Mesa Sites and 45DO673.

The chi-square test results in Table 14 were used to test the null hypothesis; no technological variability occurs between individual hinterland Mesa sites. The null hypothesis is rejected. Differences in the distribution of size classes do not occur due to random chance at a 95% confidence interval. To address the possibility of Type 1 error given the large sample sizes, a Cramer's V strength relationship test was run (0.048) suggesting a weak correlation. An overall chi-square test statistic of $\chi^2=73.14$ ($n=15,366$, p (probability) ≤ 0.01 , df (degrees of freedom) $=8$) indicates significant difference in distributions between size classes overall. Significance specifically is driven by differences in Sizes Classes 1 and 4 at Mesa 06 and Size Classes 3 and 4 at Mesa 36. Significant differences were not found in Size Classes 1, 3, and 4 at Mesa 12.

When a chi-square test is used to compare Mesa sites individually,debitage size class distributions differ significantly across at least two size classes (Appendix A). Considering that the Mesa site assemblages differ significantly from each other and 45DO673 they will be discussed independently in the following chapter, instead of treating the sites as a single "Mesa" analytical unit.

Table 14. Mesa Site Size Class Chi-Square Test^a

		Size Class 1	Size Class 2	Size Class 3	Size Class 4
Mesa 12 (45GR144)	Observed	16	331	3008	2519
	Expected	20.6	388.39	2978.29	2486.68
	χ^2 ^b	1.04	8.48	0.30	0.42
	Ar ^c	-1.3	-3.8^c	1.0	1.1
Mesa 36 (45GR145)	Observed	2	121	998	1049
	Expected	7.63	143.48	1100.25	918.64
	χ^2	4.15	3.52	9.50	18.5
	ar	-2.2	-2.1	-4.7	6.1
Mesa 06 (45GR162)	Observed	36	564	3785	2937
	Expected	25.73	484.13	3712.46	3099.68
	χ^2	4.10	13.18	1.42	8.54
	Ar	2.8	5.2	2.3	-5.3

^a= Significant Cells in **Bold and Highlighted**^b= Critical Value of 12.59^c= Adjusted Residuals

Table 15 depicts four columns (size classes) and three rows (the compared assemblages). The null hypothesis that no technological variability occurs between individual hinterland Mesa sites and a riverine site is rejected. Differences in the distribution of size classes do not occur due to random chance. To address the possibility of a Type 1 error given the large sample sizes, a Cramer's V strength relationship test was run ($V=0.148$, $n=15,366$) suggesting a weak correlation. An overall chi-square statistic of $\chi^2=1083.80$ ($n=18,450$, p (probability) ≤ 0.01 , df (degrees of freedom) $=9$) indicates significantly different distributions between size classes over all four sites. Significance is driven primarily by the differences in Size Classes 3 and 4 at 45DO673 and Mesa 12. While still significant, the differences in Mesa site size classes impact the statistic much less.

Table 15. All Sites Size Class Chi-Square Test^a

		Size Class 1	Size Class 2	Size Class 3	Size Class 4
Mesa 12 (45GR144)	Observed	16	331	3008	2519
	Expected	20.7	358.81	2701.08	2793.41
	χ^2	1.06	2.16	34.87	26.96
	ar ^c	-1.3	-1.8	9.7^c	-8.7
Mesa 36 (45GR145)	Observed	2	121	998	1049
	Expected	7.64	132.55	997.85	1031.96
	χ^2	4.17	1.01	0.00	0.28
	ar	-2.2	-1.1	0.0	0.8
Mesa 06 (45GR162)	Observed	36	564	3785	2937
	Expected	25.80	447.26	336.93	3482.02
	χ^2	4.04	30.47	51.91	85.31
	ar	2.6	7.3	12.6	-16.4
45DO673	Observed	11	111	693	2269
	Expected	10.87	188.38	1418.14	1466.61
	χ^2	0.00	31.79	370.79	438.99
	ar	0.0	-6.4	-28.7	31.7

^a= Significant Cells in **Bold and Highlighted**^b= Critical Value of 12.59^c= Adjusted Residuals

The large sample sizes (Observed Frequency) affect how sensitive the chi-square test is and increase the probability of Type 1 errors (showing significance where it does not exist and falsely rejecting the null hypothesis). Given that the strength relationships test depicts a weak correlation and the slight frequency differences depicted in Figure 17, any differences between size classes at any of the four sites are backed up by further analytical evidence such as flake type and stone tool analysis.

Debitage Type

Following the model described in Chapter III, the top and bottom components of Mesa 12 are first separated and compared to look for any variation acrossdebitage type classes (Figure 18).

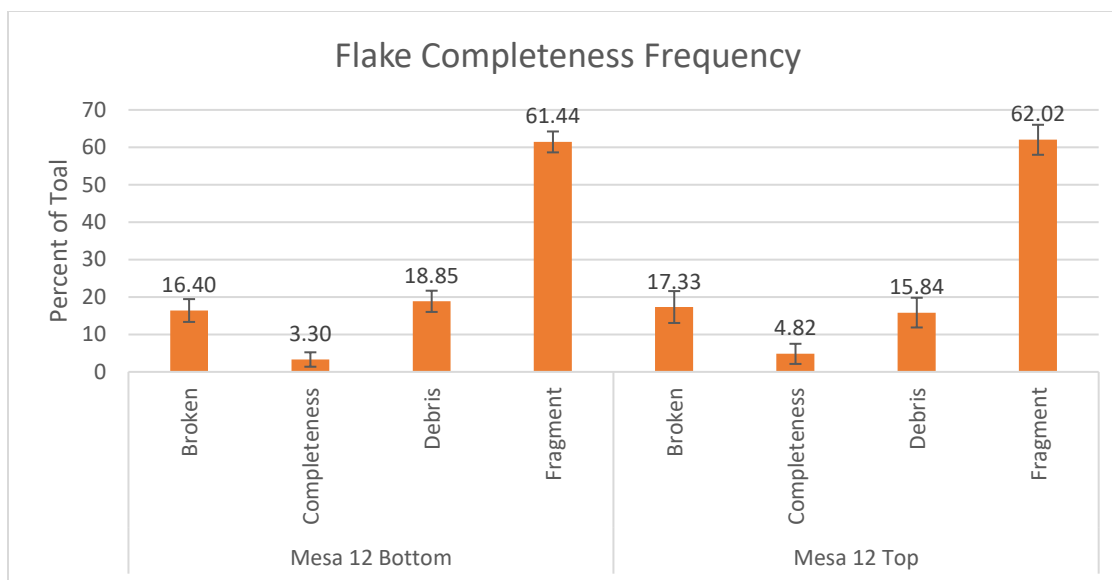


Figure 18. Debitage Frequency by Flake Completeness Mesa 12 Top and Bottom.

While minor differences are present, the general trends remain the same between the top and bottom assemblages of Mesa 12. Complete Flakes make up less than 10 % of both assemblages. The most notable difference is a slightly higher frequency of Debris than Broken Flakes at Mesa 12 bottom whereas the opposite is true at the top. However, the differences in Broken Flakes and Debris frequencies are not statistically significant (Appendix B). Due to the similarities in flake types, thedebitage from Mesa 12 top and bottom assemblages will be combined for comparison of flake types to Mesa 06 and Mesa 36. As discussed above, Mesa 06 and Mesa 36 do not have assemblages below the Mesa top.

When arranged by completeness (including 1/8" flakes), flake fragments are evenly distributed across all three Mesa site assemblages at approximately 60% (Figure 19). The distribution of flake completeness from Mesa 06, Mesa 12, and Mesa 36 are assigned Rank 1 sampling curves, indicating that the samples are representative. Flake completeness was not measured at 45DO673 during analysis by Root et al. (2016). At

Mesa 06 and Mesa 36, Broken Flakes make up the next most frequent category at 18.9% and 17% respectively. The second most frequent category at Mesa 12 is Debris, at 17%. Debris is the third most frequent at both Mesa 06 (11.9%) and Mesa 36 (13.2%) while Broken Flakes are third most frequent at Mesa 12 (15.3%). Complete flakes are the least frequent at every site with 3.8% at Mesa 12, 7.9% at Mesa 36, and 9.5% at Mesa 06.

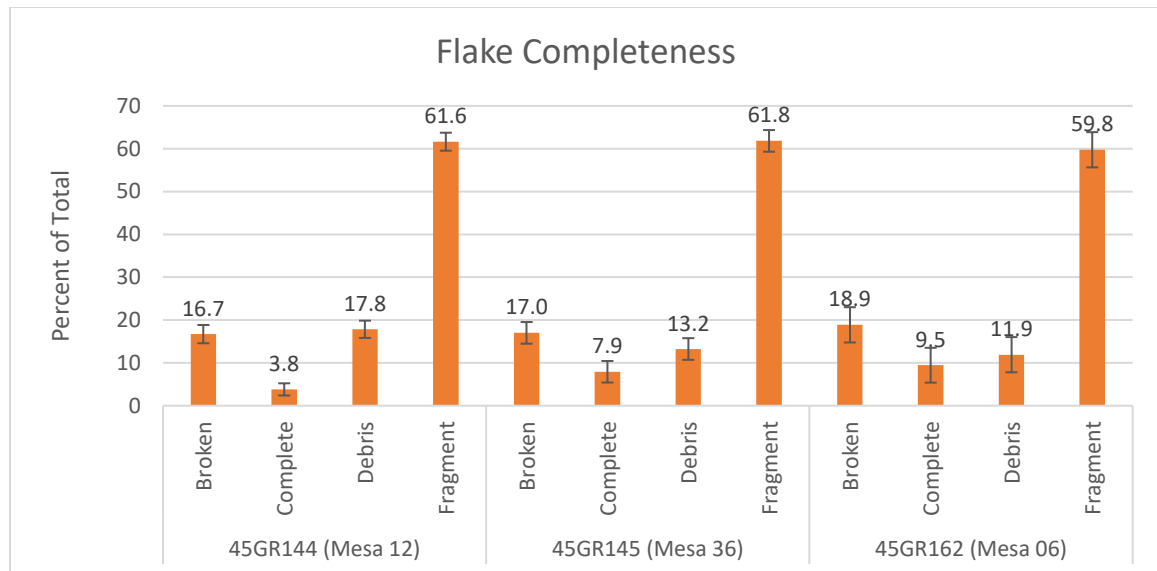


Figure 19. Flake Completeness.

An overall chi-square stat of $\chi^2=1083.90$ ($n=15,914$, $p<0.01$, $df=8$) indicates significantly different distributions between flake types over all three Mesa sites (Table 16). The null hypothesis; no technological variability occurs between individual hinterland Mesa sites and a riverine site is rejected. Differences in the distribution of size classes do not occur due to random chance. Significance is primarily driven by complete flakes at Mesa 06 and 12. The Mesa 12 Complete, Broken, and Debris class distributions are significantly independent from Mesa 36 and Mesa 06. Mesa 36 does not show significantly different distributions in any flake class. A Cramer's V strength relationship test ($V=0.08$, $n=15,914$) suggests a very weak correlation, likely due to the similar

frequencies between flake classes and to the large sample size. Since the frequency of flakes in each of the four classes at Mesa 36 are not significantly different, this result should be considered suggestive instead of significant.

Table 16. Completeness Test of Independence ^a

Site	X ²	Complete	Fragment	Broken	Debris
45GR144 Mesa 12	Observed	229.00	3703.00	1004.00	1072.00
	Expected	426.99	3650.33	1069.16	861.52
	χ^2	39198.28	2774.13	4246.18	44301.12
	ar ^c	-12.6^c	1.8	-2.9	9.8
45GR145 Mesa 36	Observed	179.00	1396.00	384.00	299.00
	Expected	160.47	1371.91	401.83	323.79
	χ^2	343.18	580.25	317.76	614.43
	ar	1.6	0.9	-0.6	-1.7
45GR162 Mesa 06	Observed	723.00	4570.00	1444.00	911.00
	Expected	543.54	4646.76	1361.01	1096.69
	χ^2	32206.06	5891.84	6887.10	34481.04
	ar	11.1	-2.4	3.3	-8.4

^a= Significant Cells in **Bold and Highlighted**

^b= Critical Value of 12.59

^c= Adjusted Residuals

Flake Completeness by Size Class

Flake Completeness by class size is compared below based on work by Prentiss (2001). Prentiss' experimental studies indicated that for researchers to produce valid data from the Sullivan and Rozen (1985) classification the data must be sorted by class sizes. At Mesa 06, Flake Fragments have the highest frequency in all class sizes followed by Broken Flakes across all size classes except for Class 1 (Figure 20). Complete and Debris categories are evenly distributed in Size Class 4 but otherwise vary. Fragments are most frequent in all size classes followed by Broken Flakes in all but Size Class 1. Complete Flakes are least frequent in every size class. Site 45DO673 is not included in the following data as flake completeness data are not available from that site.

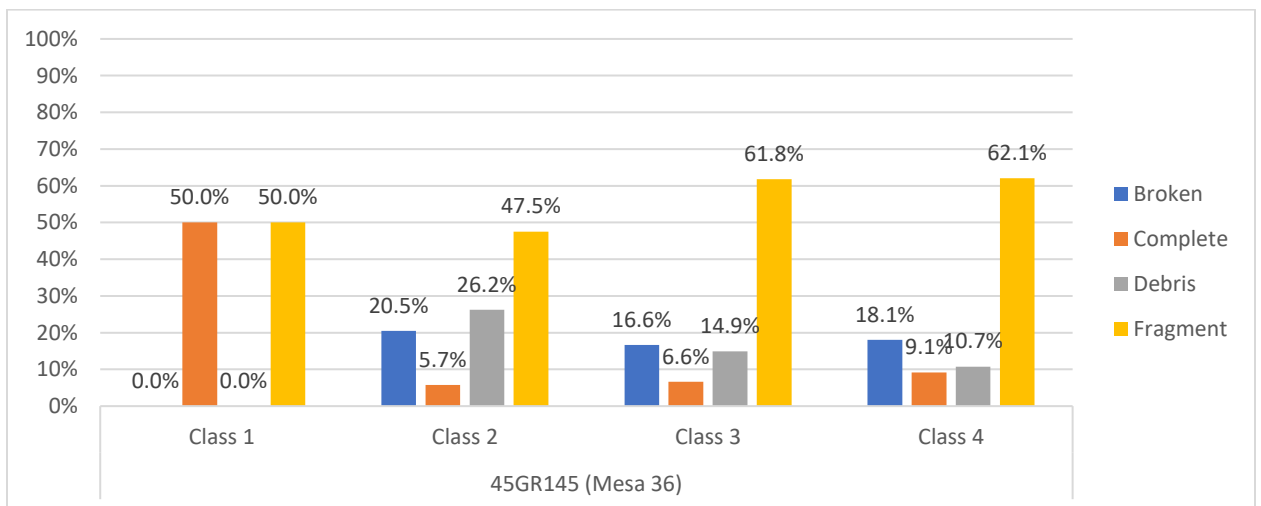
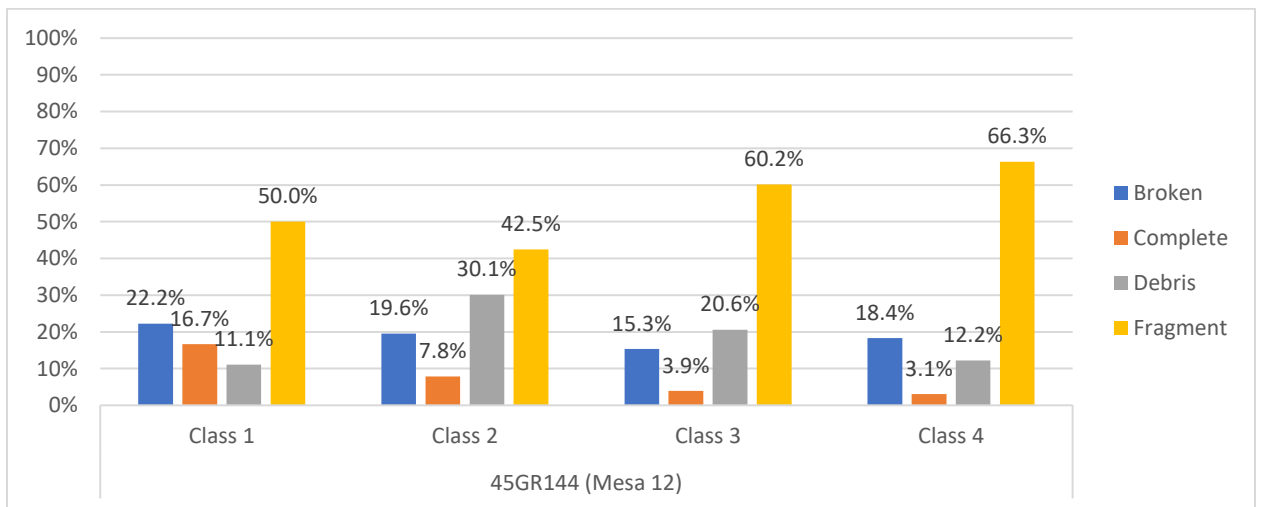
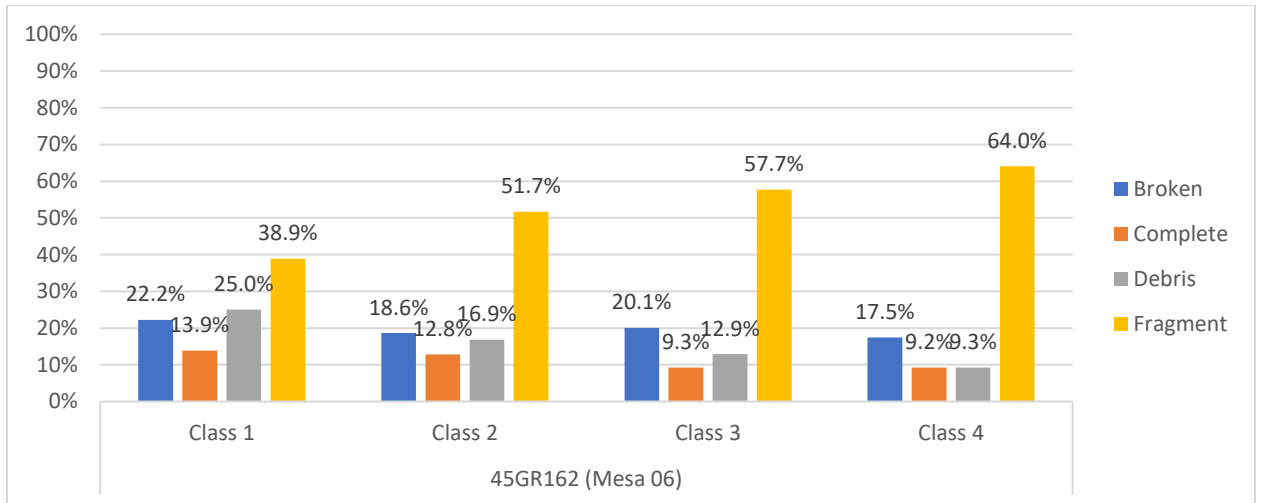


Figure 20. Mesa 06, 12, and 36 Flake Completeness by Class Size.

Fragments again are most frequent across Mesa 12 size classes, accounting for over 50% of the total in all but size Class 2 (42.5%) (see Figure 20). Complete Flakes are lowest in all classes except Class 1 where they account for 16.7% with Debris being the lowest. Debris is most frequent in Size Classes 2 and 3 whereas Broken and Fragmented Flakes are most common in Size Class 4.

In general, Mesa 36 follows similar patterns in completeness by size to Mesa 06 and Mesa 12 with notable differences in Size Class 1, which is nearly absent from Mesa 36. Size Class 2 matches Mesa 12 distributions with Fragments and Debris being the most frequent. Size Class 3 has roughly even distributions of Broken Flakes and Debris. Complete Flakes are lowest in Size Classes 2, 3, and 4. Similar to Mesas 06 and 12, Size Class 4 is primarily composed of Flake Fragments and Broken Flakes. Prentiss' (1998, 2001) findings suggest that frequencies at Mesa 06, 12, and 36 indicate tool production. Even when cores are present in the stone tool assemblage, debitage size and type data do not appear to support core reduction activities. Core reduction evidence (Complete Flakes and Flake Fragments in larger size classes) is absent from all three assemblages.

Debitage Summary

Size grading techniques indicates a more prominent focus on early reduction stages at Mesa 06 and Mesa 12, with the first three size classes accounting for over 90% of the assemblage. The Mesa 36 assemblage exhibits more middle to late stages of reduction. Flake completeness data following the Sullivan and Rozen (1985) method indicate Flake Fragments are most common at all sites and Complete Flakes the least common, matching the size class data. All sites have collectively higher frequencies of Flake Fragments and Broken Flakes in Size Class 4.

Stone Tool Assemblage

Following the model described in Chapter III, the top and bottom components of Mesa 12 are first separated and compared to look for any variation across tool type classes (Figure 21).

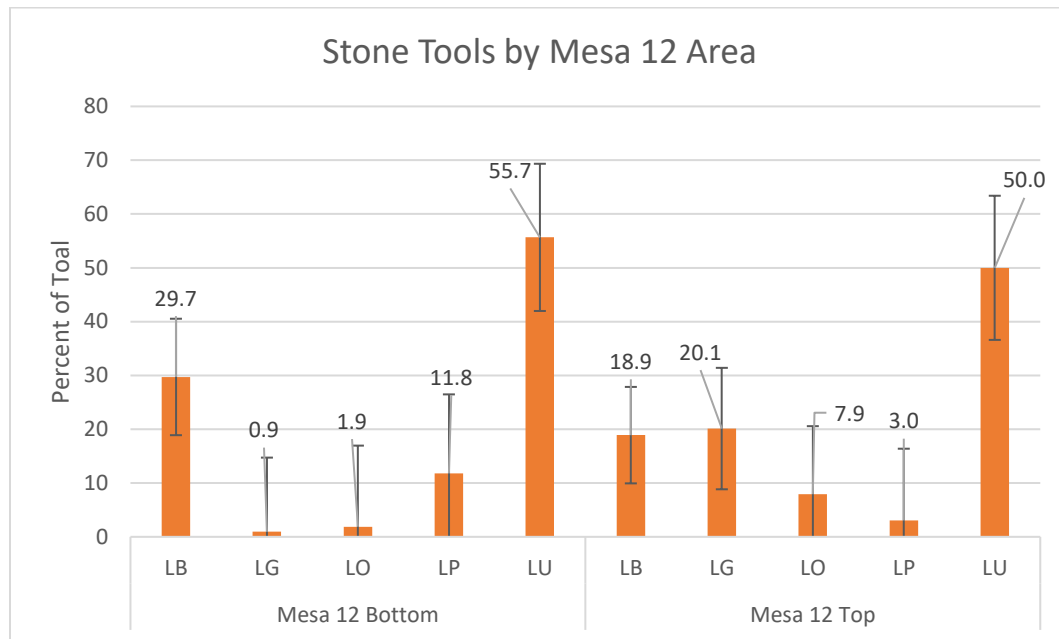


Figure 21. Stone Tool Assemblage by Mesa 12 Area.

Even without the aid of chi-square analysis, clear differences in stone tool percentages are shown in Figure 21. The only similarly distributed category is Utilized artifacts. Bifaces make up a higher percentage of the assemblage at the base of Mesa 12 whereas Ground Stone and Cores are much lower. Projectile points are slightly more even but make up a higher percentage of the assemblage at the bottom of Mesa 12. Overall, the distribution of tool types at the top of the Mesa is more even than at the bottom. Considering the differences, the top and bottom of Mesa 12 will be split for comparison to Mesa 06, Mesa 36, and 45DO673.

The distribution of tool classes from Mesa 06 and Mesa 12 are assigned Rank 1 sampling curves, indicating that the samples are representative. Tools from Mesa 36 and 45DO673 are assigned a Rank 3 sampling curve, indicating that the samples are not representative. Utilized flakes are the most frequent tool class across all sites uniformly followed by bifacially modified tools at all locations with exception to the top of Mesa 12 where Ground Stone is the second most frequent category (Figure 22). Projectile points are the third most frequent at Mesas 06, 36, and Mesa 12 Bottom. Cores occur in low frequencies at 45D0673 and Mesa 12 Bottom. Mesas 36 and 06 have similar distributions of stone tools as do 45DO673 and the Bottom of Mesa 12. The top of Mesa 12 appears to have a more unique distribution. The significant differences in distributions between locations will be subject to a chi-square test to determine which differences in distributions are significant.

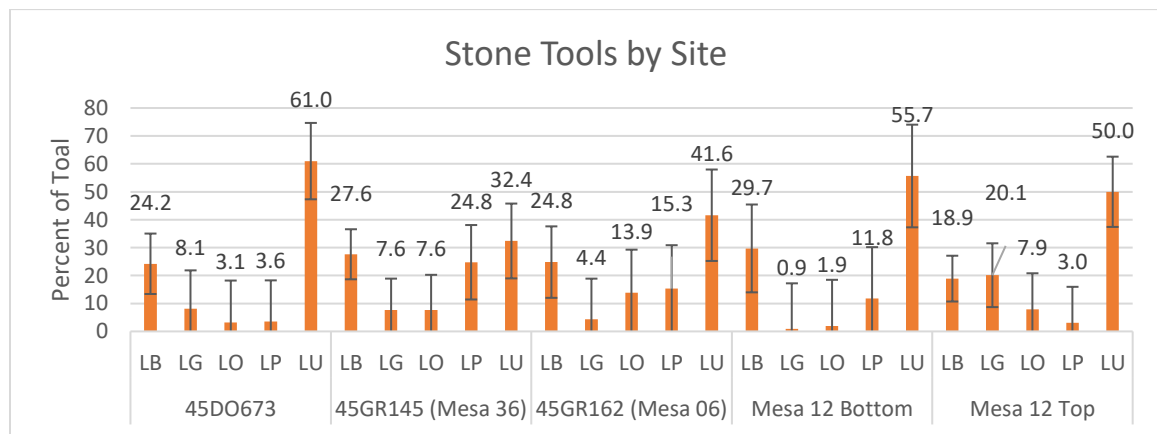


Figure 22. Stone Tool Assemblage by Site.

As noted in previous chapters the chosen categories for tool comparison are limited, while mutually exclusive variation is potentially masked by a wide range of variables being included under a single class. Since all categories occur at each site, the analysis and discussion will focus on the evenness of the distributions rather than the

richness, as all sites have the same richness value. In the case of Lithic Utilized category at Mesa 12, sixteen large basalt chopper artifacts are included. These are morphologically unique to Mesa 12 due to their size and bifacial flaking modification which occurs on a single edge but does not extend past the margins (Figure 23). In addition, these artifacts are exclusive to the Bottom of Mesa 12 (Area 1201) (Figure 24). The presence of these additional tools types at the Bottom of Mesa 12 suggest that variation is being masked when compared to Mesas 06 and 36 as a result of the broad categories discussed above.

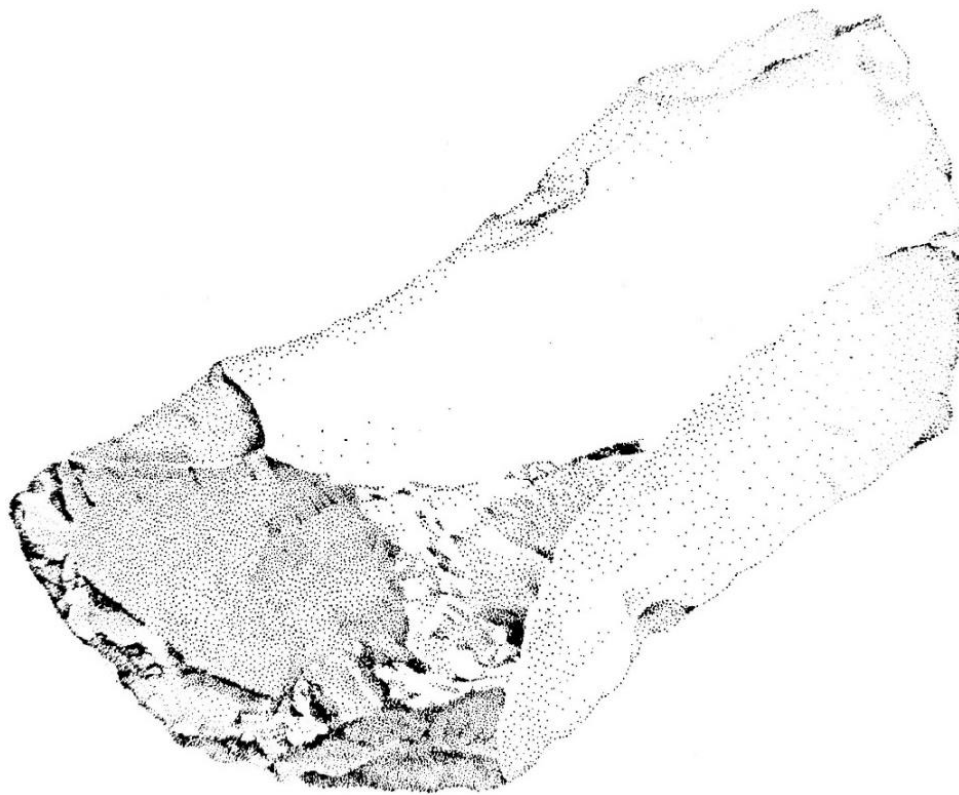


Figure 23. Mesa 12 Basalt Chunk Tool Example Smith (1977:50-51).

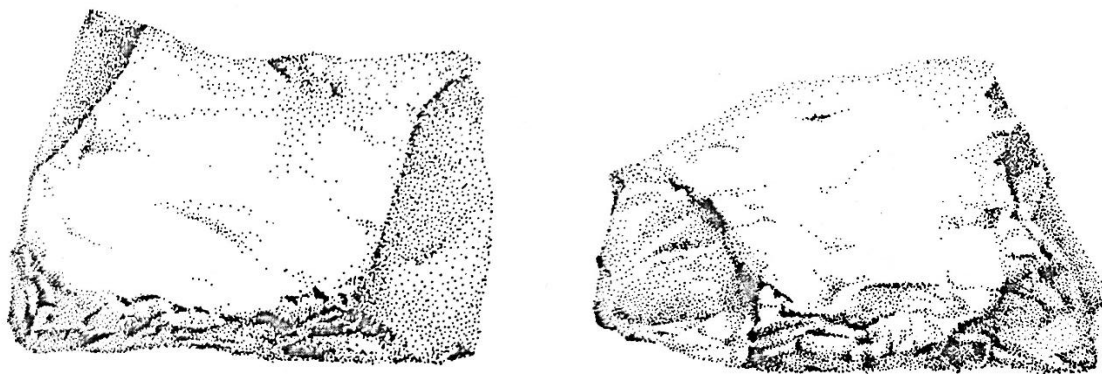


Figure 24. Mesa 12 Basalt Chunk Tool Example Smith (1977:50-51).

A chi-square statistic of $\chi^2=133.72$ ($n=619$, $p<0.01$, $df=12$) indicates significantly different distributions between tool types over all four locations (Table 17). The null hypothesis: no technological or functional variability occurs between individual hinterland Mesa sites and a riverine site is rejected. Differences in the distribution of size classes do not occur due to random chance.

Significance is driven primarily by significantly different distributions in ground stone at Mesa 12 Top and Bottom and by projectile point frequencies at Mesa 36. Cramer's V strength test score of 0.21 ($n=618$) indicates a moderate correlation.

Table 17. Chi Square Analysis Tools^a

Site	X ²	Utilized Flake	Biface	Projectile Point	Core	Ground Stone
45GR144 Mesa 12 Top	Observed	82.00	31.00	5.00	13.00	33.00
	Expected	83.27	41.15	16.58	9.95	13.07
	χ^2 ^b	1.61	102.95	133.99	9.33	397.39
	ar ^c	-0.22	-2.04	-3.34	1.11	6.41
45GR144 Mesa 12 Bottom	Observed	118.00	63.00	25.00	4.00	2.00
	Expected	107.64	53.19	21.43	12.86	16.89
	χ^2	107.36	96.25	12.77	78.43	221.69
	ar	1.65	1.80	0.94	-2.95	-4.37
45GR145 Mesa 36	Observed	34.00	29.00	26.00	8.00	8.00
	Expected	53.31	26.34	10.61	6.37	8.37
	χ^2	372.94	7.06	236.78	2.67	0.13
	ar	-4.03	0.64	5.33	0.71	-0.14
45GR162 Mesa 06	Observed	57.00	34.00	21.00	19.00	6.00
	Expected	69.56	34.37	13.85	8.31	10.91
	χ^2	157.72	0.14	51.17	114.32	24.15
	ar	-2.35	-0.08	2.22	4.18	-1.69
45DO673	Obs	136.00	54.00	8.00	7.00	18.00
	Exp	113.22	55.95	22.54	13.52	17.77
	χ^2	518.77	3.80	211.37	42.55	0.05
	ar	3.56	-0.35	-3.77	-2.14	0.07

^a= Significant Cells in **Bold and Highlighted**

^b= Critical Value of 12.59

^c= Adjusted Residuals

A chi-square test shows no significant difference between the distributions of bifacial tools between the four sites, indicating that differences are due to random chance. However, significantly different distributions of bifaces are present at the top of Mesa 12. Difference in projectile point distributions are significant at all sites, varying between 3% and 24.8% of the assemblages with exception of Mesa 12 Bottom. The Top of Mesa 12 has the lowest occurrence of projectile points at only 3% of the assemblage. Utilized flakes occur most frequently in all assemblages (32.4% to 61%) and occur at significantly different frequencies at 45DO673, Mesa 06, and Mesa 36 but not at either of the Mesa 12 locations. Ground stone makes up the greatest amount of any assemblage at Mesa 06.

The distribution of ground stone is significantly different only between the Top of Mesa 12 and the Bottom of Mesa 12.

Mesa 06 has the highest frequency of cores out the four sites, while 45DO673 and the Bottom of Mesa 12 have the lowest frequency. Core distributions vary significantly at Mesa 06, 45DO673, and the Bottom of Mesa 12. When the Mesa sites are individually compared, cores vary significantly between Mesa 12 and Mesa 36 and between 45DO673 and Mesa 36.

Stone Tool Diversity

Decades of research into stone tool function and morphology have shown that lithic tools are multi-functional (Andrefsky 2005a:201). Purely functional based stone tool classes do not consistently predict site function (Andrefsky 2005a:202-203). Quantifying artifact diversity can be useful with associating some artifact forms to site function when combined with additional lines of evidence.

Increased tool diversity would be expected at riverine village occupation sites where a broader range of tasks were conducted, or resources processed. The notion that Mesas have limited activities and therefore lower diversity while riverine sites have more activities and therefore higher diversity is derived from the Sanpoil-Nespelem settlement model discussed in Chapters III and IV. Based on previous research and predictions about Mesa site function, lower tool diversity as either resource gathering locations or defensives refuges can be assumed (Chatters 2004; Galm 2006; Smith 1977:82). Furthermore, the riverine sites should have more generalized tools while the Mesa sites should contain more task specific tools. To calculate diversity, the Shannon Diversity Index is applied for each tool type which accounts for both richness (number of classes)

and evenness (frequency of values in classes) following Rindos (1989) and Shannon (1948). Considering that all tool classes are filled at each site, a calculation of diversity will be best described by the evenness score which is calculated by dividing the Shannon Diversity Index score (H) by the natural logarithm (Rindos 1989). The evenness score ranges from 0 to 1, the higher the score the more evenness in the dataset (Table 18).

Table 18. Stone Tool Diversity

Site	H ^a	Evenness ^b	Sample Sizes
45GR145 (Mesa 36)	1.47	0.91	105
45GR162 (Mesa 06)	1.41	0.88	137
45GR144 (Mesa 12 Top)	1.29	0.80	164
45DO673	1.08	0.67	223
45GR144 (Mesa 12 Bottom)	1.06	0.66	212

^aH=Shannon Diversity Index Score

^b=H/ln(proportion of tools relative to total tools)

Mesa 36 has the highest evenness of all three sites with Mesa 06, The Top of Mesa 12, 45DO673, and the Bottom of Mesa 12 following respectively. The results detailed above establish the presence of variation between size class, flake completeness, and stone tool types between the three tested Mesa sites, between the Top and Bottom of Mesa 12, and between the Mesa sites and 45DO673. How those results fit expectations developed from site land use models will be discussed in Chapter VI.

DISCUSSION AND INTERPRETATION

The following discussion interprets the data above and builds a historical narrative in light of previous settlement models developed for Mesa sites to address the implications of interpretations made about Mesa site function. The variation between individual Mesa sites within hinterland environments and an occupation site in a riverine environment was shown in the previous chapter. This chapter is organized by the two site use models discussed in Chapters II and III. The results of the analysis are then discussed considering the expectations of each model, ultimately deciding if the results adhere to the settlement systems to further discuss Mesa site function and completing Objective 4 of this study. Not all data sets or results are well suited for application under each model and therefore only those data sets that can be applied to the model expectations are discussed at length.

Sanpoil-Nespelem Model

Expectations regarding lithic frequencies and diversity are discussed in Chapter III and are summarized in the table below (Table 19).

Table 19. Sanpoil-Nespelem Lithic Expectations (derived from Ray 1993).

Expectation	Stone Tool Diversity	Lithic Technology
Mesa sites are seasonal procurement sites with riverine locations as semi-permanent long-term occupation sites	Stone tools should be less diverse at Mesa sites than riverine sites	Lithic reduction should be similar between Mesa sites but different between river and Mesa sites

Completeness

After a comparison of flake types (Sullivan and Rozen 1985) and flake type in relation to size classes (Prentiss 2001), reduction strategies at all three Mesa sites focus on late stage reduction, maintenance, and sharpening as indicated by higher frequencies of Flake Fragments and Broken Flakes in the two smaller size classes (Size Classes 3 and 4). Based on flake size and flake completeness analysis, core reduction activities are minimally represented at Mesa 06, 12, and 36. The assemblage from 45DO673 was not comparable by flake completeness, but Root et al. (2016:134) found that the occupants of 45DO673 focused on late stage reduction and tool maintenance while doing little in the way of core reduction.

Mesa 06 and Mesa 12 have significantly different Complete, Broken, and Debris frequencies. At Mesa 36 no significant differences are found to either Mesa 06 or Mesa 12 across all four flake types. Debitage at Mesa 36 is more technologically like both Mesa 06 and Mesa 12 than Mesa 06 and 12 are to each other based on flake completeness. Based on this result, it is possible that the Mesa 36 lithic assemblage represents a wider array of reduction strategies than those used at Mesa 06 and 12. Ultimately debitage as measured by flake completeness is similar between Mesa sites, all focusing on late stage reduction, maintenance, and sharpening. Flake completeness data meets expectations set forth by the Sanpoil-Nespelem settlement model.

Debitage Size Class

All three Mesa sites are focused on late stage tool reduction, maintenance, and re-sharpening as expected based on the Sanpoil-Nespelem model and matching flake completeness data. However, 45DO673 was also found to be focused on tool reduction

activities with very little core reduction, an unexpected result of a biannual or annual riverine occupation (Ray 1932). Despite all four sites ultimately concentrating on late stage tool reduction, not all reduction strategies are the same as depicted by the chi-square analysis in Chapter V (Appendix A). Based on this evidence it appears that variation is not caused by large changes in reduction strategies but possibly by the types of tools produced at each site.

Stone Tools and Diversity

Specific expectations regarding individual tool types are not given for the land use, ethnographically driven, Sanpoil-Nespelem model. However, activity types based on the utilized, biface, ground stone, and projectile point categories, as well as stone tool evenness implications, are generally clear based on the assumptions shown in Table 19 and discussed in Chapter IV

A significantly different distribution of utilized tools at Mesas 06, 36, and 45DO673 fits with lithic expectations based on the Sanpoil-Nespelem model developed for this study. Within the Sanpoil-Nespelem model framework this result is expected, different tool types would be required depending on the subsistence requirements or subsistence purposes of each site and therefore are likely to differ between sites. The fact that significant differences are present only confirms that the Mesa sites likely had a general purpose with variation caused by the specific changes in selective conditions at individual sites. For example, the tool kit requirements could be driven by the presence of root crops or game trails at or near each site.

The lithic utilized category contains large flaked basalt chopping tools only at the Bottom of Mesa 12, a unique occurrence out of the four studied sites. Considering that

raw material sources in the form of angular basalt rocks are frequent at all site locations, they should appear in all assemblages. Basalt is a more durable raw material than chert (Luedtke 1992) and more suited to high impact tasks such as chopping or crushing. Mesa 12 has five potential raw material sources within a one-mile radius based on Frenchman Springs, Priest Rapids, or Roza basalt flow contacts where interbed layers elsewhere have yielded tool stone raw material. Mesa 06 and Mesa 36 have three and four potential sources respectively. Based on the potential for nearby raw material, Mesa 12 would be expected to have chert chopping tools instead of basalt, suggesting that the preference for basalt may have been related to raw material properties, specifically that the higher durability of basalt would increase the performance of the tool. Decreased chert tool stone may select for a higher use of low-cost but more durable (higher performance) basalt tools.

With exception to the Top of Mesa 12, the frequency of bifacial artifacts does not vary significantly between any of the five examined assemblages. No significant variation occurs when each Mesa site is compared individually to each other or individually to 45DO673 (Appendix A). If the Mesa sites are task specific camp sites that are part of a seasonal round, then artifacts should be more specialized based on the Sanpoil-Nespelem model. The lack of variation in the frequencies of non-hafted bifacial tools is more likely due to the versatile nature of bifacial artifacts as cutting, scraping, or hafted projectile tools (Andrefsky 2005a) requiring nearly any toolkit to have bifacial artifacts of some kind. Some unmeasured source of variation is likely the reason for a significantly different distribution of bifacial artifacts on the Top of Mesa 12, suggesting

that selective conditions at the Top of Mesa 12 were different than at the other measured locations.

Unlike bifacial artifacts, ground stone is expected to vary between site types based on lithic expectations developed for this thesis from Smith's (1977:10-13) Sanpoil Nespelem Model and Ray (1932). However, the distribution of ground stone artifacts only varies significantly at the Top and Bottom areas of Mesa 12, suggesting again that selective conditions differed from Mesas 06, 36, and 45DO673. When individually compared, ground stone at Mesa 36 differs significantly from Mesa 12 and 45DO673 but does not differ significantly from Mesa 06, suggesting that ground stone use between Mesa 36 and Mesa 06 was similar (Appendix A). Ground stone is often associated with plant or animal processing tasks (Adams 2002), activities that would be unlikely to occur at sites with highly specialized functions such as short-term hunting camps. Similar to bifacial artifacts, ground stone tools are often multi-purpose (Adams 2002:22). This category at all sites includes stones, such as bettered cobbles, that likely were used for purposes other than food production. Without specific use-wear or material analysis, several implications are clear. First, ground stone frequencies do not differ between Mesa sites and the riverine site (45DO673), suggesting that activity types are different between microenvironments and within hinterland environments. However, ground stone does differ at Mesa 12, suggesting that specific conditions occurred at Mesa 12 that did not at the other locations. Second, Mesa site use as procurement areas where ground stone would be used is expected according to the Sanpoil-Nespelem model and suggested by Galm (2006).

Projectile points differ significantly between all sites except the bottom of Mesa 12. Evidence gained from debitage analysis indicates all five locations had lithic industries focused on tool production, specifically biface reduction, thus supporting higher frequencies of finished tools such as projectile points at all sites. The variation in frequency further supports the likely differences in activity types between Mesa sites themselves and between Mesa and riverine occupations. Projectile points are most frequent at Mesa 06 but account for the highest portion of the assemblage at Mesa 36. The lack of significant variation at the Bottom of Mesa 12 again suggests that selective conditions may have varied between the Top and Bottom of Mesa 12, as well as between the remaining three locations. Based on the Sanpoil-Nespelem model, the significantly low frequency of projectile points at 45DO673 are expected as these tool types are task specific and are more likely to occur at hinterland procurement locations (Ray 1932).

Although some relationships between tool type distributions and debitage do adhere to the Sanpoil-Nespelem model, none of the sites uniformly fit expectations. While a perfect match is not required to evaluate the use of the model, the unexpected diversity score results indicate that the Mesa sites, except the Bottom of Mesa 12, are more diverse than 45DO673. This result is opposite of the ethnographically informed Sanpoil-Nespelem model.

Dunnell and Dancey (1983) Expectations

Expectations stemming from Dancey (1973) and Dunnell and Dancey (1983) are best met when considering diversity and stone tool frequencies between Mesa and riverine locations. Three expectations can be set forth based on Dunnell and Dancey's (1983) model discussed in Chapter III (Table 20).

Table 20. Lithic Assemblage Expectations between Microenvironments.

Dunnell and Dancey (1983) Model Expectations ^a	Diversity	Stone Tool Assemblage
1. Mesas and 45DO673 have the same functions	Same or lower diversity score	No significant differences between tool categories
2. Mesa are combination of activities	45DO673 has greater diversity	Significant differences in tool categories
3. Mesas and Riverine have completely separate functions	Mesa sites are more diverse	Significant differences in tool categories

^a Adapted from Dunnell and Dancey (1983:275)

Flake Completeness

To test if the lithic assemblage at Mesa 36 is a sample of Mesa 06 and 12, as suggested by Dunnell and Dancey (1983) and Dancey (1973), the flake completeness data from Mesa 06 and 12 is combined to test the null hypothesis, no variation exists between a combined Mesa 06 and Mesa 12 lithic assemblage and Mesa 36. As shown in Chapter V, Mesa 36 did not differ significantly from either Mesa 06 or Mesa 12 except in flake completeness, suggesting the possibility that Mesa 36 could be a sample of the other Mesa sites. A chi-square statistic of $\chi^2=6.11$ ($n=15,914$, $p<0.01$, $df=4$) indicates no significantly different distributions between flake types occur (Table 21).

Table 21. Chi-Square Completeness Test Combined Mesa 06/12 and Mesa 36^a

		Complete	Fragment	Broken	Debris
45GR144 Mesa 12/ Mesa 06	Obs	952	8273	2448	1983
	Exp	970.53	8297.09	2430.17	1958.21
	X ^{2b}	0.35	0.07	0.13	0.31
	ar ^c	-1.6	-1.1	1.1	1.6
45GR145 Mesa 36	Obs	179	1396	384	299
	Exp	160.47	1371.91	401.83	323.79
	X ²	1.6	1.1	-1.1	-1.6
	ar	2.14	0.42	0.79	1.90

^a= Significant Cells in **Bold and Highlighted**

^b= Critical Value of 12.59

^c= Adjusted Residuals

The null hypothesis: no variation exists between a combined Mesa 06 and Mesa 12 lithic assemblage and Mesa 36 is accepted. Differences in the distribution of flake completeness occur due to random chance. A Cramer's V strength relationship test (0.08, n=628) suggests a very weak correlation likely due to both the similar frequencies between flake classes and the large sample size. Therefore, following Dunnell and Dancey's (1983) model, the debitage at Mesa 36 is confirmed as a sample of Mesa 06 and 12, indicating that reduction strategies present at both Mesa 06 and Mesa 12 are repeated at Mesa 36.

Results indicate that variation between the Mesa sites occurs in the two smallest size classes. Since tool production is the most common activity at all three Mesa sites then it is unlikely that the variability is caused by differences in reduction strategies and more likely that variation in the types of tools produced is present. Unlike comparisons by Vaughn (2010) and Lewis (2015), the variation is not caused by exotic material type (obsidian, dacite, etc.) differences between sites, as chert accounted for over 90% of the debitage assemblage at all three sites.

What is known is that chert and basalt raw material, while not scarce in these environments, does vary within the hinterland microenvironment. Galm (2006) reports locating natural chert nodules around Mesa 18, which is located approximately 20 miles northwest of all three sites. Columbia River Basalt Group contacts and springs that are likely to contain Ellensburg Formation interbeds occur within a mile of each Mesa site, suggesting that raw material availability may have been similar between Mesa sites. No contacts occur within a mile of 45DO673. However, large tool stone bearing cobble bars may be present within one mile of the site. Mesa 36 is distinct for its lack of significance across all four flake types. Mesa 36 is adjacent to a potential tool stone material source and has at least four other potential source locations within one mile. If raw material source is a selective condition at Mesa 36, then its proximity may encourage greater flexibility and experimentation in stone tool reduction techniques. The cost of acquiring tool stone is low while the performance benefit is increased through a more diverse reduction strategy.

Stone Tools and Stone Tool Diversity

The utilized tool (LU) category is most common at all sites. Mesa 06 and 45DO673 differ significantly while Mesa 12 does not. LU artifacts at the Top of Mesa 12 and Mesa 36 differ significantly when individually compared to 45DO673, but not the Mesa 12 Bottom assemblage. The lack of significance when distributions are compared to 45DO673 suggests that while specific activities associated with these tool types are unknown, their use was significantly similar at Mesa 12 and 45DO673, both Frenchmen Springs dated components. With a higher diversity than 45DO673, Mesas 06, 36, and 12 Top do not fit assumptions of Dunnell and Dancey's (1983) model. Mesa 12 Bottom

does adhere to the expectations of assumption two, as lithic utilized artifacts are not significantly differently distributed.

Bifaces are found in similar frequencies at all four sites except the Bottom of Mesa 12, suggesting that activity types at each of the four sites appear to have had similar requirements for bifacial tools. Since these tools are considered less specialized when compared to artifacts such as ground stone or projectile points, this outcome fits the first expectation given by Dunnell and Dancey (1983). However, only Mesa 06 and Mesa 36 fit the second assumption of the model based on having higher diversity scores than 45DO673.

Projectile points occur in significantly lower than expected frequencies at Mesa 06, 36, 45DO673, and Mesa 12 Bottom. They occur in significantly higher than expected frequencies at all three Mesa sites except the Top of Mesa 12 when individually tested against 45DO673. Mesa 12 Bottom specifically fits expectation two of Dunnell and Dancey's (1983) model when combined with a higher diversity score than 45DO673, suggesting that the site had a function outside of direct procurement domestic use, or a combination of the two. Mesa 06 and 36 fit expectation two of the model, suggesting a combined use of procurement and domestic functions.

Significant variation between ground stone frequencies occurs between Mesa sites and riverine sites, specifically at Mesa 12, suggesting that while Mesa 06, 36, and Mesa 12 Top meet expectation three of Dunnell and Dancey's (1983) model, Mesa 12 Bottom does not neatly fit any of the site relationship expectations.

The proportion of cores varies significantly between 45DO673, Mesa 06, and Mesa 12 Bottom, as well as between Mesa 36 and Mesa 12 when individually compared.

Cores also vary significantly between the Bottom of Mesa 12 and Mesas 06 and 36. The presence of cores can be easily related to stone tool reduction activities. The fact that significant variation occurs between 45DO673 and Mesa 36 is likely due to the adjacent potential chert tool stone sources at Mesa 36 and the complete lack of potential chert interbed stone tool sources within a one-mile radius of 45DO673. The high frequency of cores at Mesa 36 correlates to both the size class and completeness data discussed above. Analysis of those data sets indicate that raw material availability is likely greater at Mesa 36 than the other two Mesa sites, or 45DO673, a suggestion supported by the adjacent potential interbed sources at Mesa 36. The adjacent raw material creates less of a differential and lowers cost for a more experimental and diverse stone tool industry. The difference between Mesa 12 Bottom and Mesa 36 is less explainable and may be due to a selective condition not measured in this study. Ultimately, Mesa 12 Top fits the first expectation of Dunnell and Dancey's (1983) model in consideration of tool types but not when combined with a higher diversity score than 45DO673. Core distributions at Mesa 06 and 36 are too variable to apply to any of the three expectations.

Mesa sites clearly had multiple functions based on the diversity of tool types, a single use is not apparent for a "Mesa Type" site and each site does not uniformly fit expectations of the model when individual stone tool frequencies are compared. While some stone tool categories match expectations, such as biface and ground stone frequencies at Mesa 06 and 36, they do not consistently align with the diversity scores calculated in Chapter V. Analysis of completeness data does indicate that as far as flake types are concerned the lithic assemblage of Mesa 36 is a sample of Mesa 06 and 12 within the same microenvironment, which matches exception two of the model.

However, when size class frequencies are tested in the same way using chi-square analysis, the outcome is not repeated and is therefore considered only suggestive.

Stone Tool Diversity

Stone tool diversity at 45DO673 falls at the lower end of the four sites (five locations) but ultimately does not meet expectations of any of the models discussed above, all of which assume higher or similar diversity in riverine environments. The high diversity of Mesa 06 and 36 suggest that more task specific tools are present than at 45DO673 or Mesa 12 Bottom. Mesa 36, with the highest evenness score of 0.91, directly adheres to the hypothesis presented in the above discussion that the adjacent potential raw material source would increase lithic experimentation. 45DO673 and the Bottom of Mesa 12 share very similar diversity scores and only have significantly different distributions in two of five stone tool categories: projectile points and ground stone. These locations are also the closest chronologically with a Frenchman Springs component apparent at the Bottom of Mesa 12

Mesa 12 Top, having the lowest diversity of the sites, is unexpected due to its geographic position between Mesa 06 and Mesa 36, representing a middle point between the remnant alkaline lakes dammed to make Billy Clap reservoir, Lake Lenore, and Soap Lake. It also presents easy north/south passage through Dry Coulee. Furthermore, when the General Land Office Maps were reviewed two trails were found to be mapped directly adjacent to Mesa 12 in 1883. These trails extend north/south through Dry Coulee to Grand Coulee and the modern Billy Clap Lake (United States Department of the Interior 2019). Mesa 12's position along these routes would suggest that higher stone

tool variation may occur, but instead the site closest to raw material sources (Mesa 36) has the greatest amount of lithic diversity.

CHAPTER VII

CONCLUSIONS

The overarching goal of this research is to determine if and how the frequency of technological and functional traits of lithic stone tools and debitage vary between the microenvironments of riverine occupation sites and hinterland Mesa occupation sites. To do this, a model was developed to best see variation in lithic assemblages. Size class data, flake completeness, and stone tool assemblage data were gathered and analyzed to test for variability in Mesa site assemblages compared to a riverine occupation at 45DO673. Considering that the available data was restricted due to excavation techniques, available lithic assemblages, and the constraints of comparable lithic analysis, this study serves best as a broad beginning into more systematic Mesa site research.

The three Mesa sites (06, 12, and 36) were found to show variation in flake size, flake completeness, and stone tool type, indicating that different selective conditions were present within the hinterland microenvironment. Specifically, Mesa 36 likely had a wider array of reduction activities compared to Mesa 12 and 36 based on flake completeness, stone tool frequencies, and stone tool evenness. Adjacent interbedded stone tool sources possibly led to differing selective conditions at Mesa 36 than at Mesas 06 and 12. The stone tool assemblage of Mesa 12 was split into top and bottom data sets for comparison as obvious differences occurred in the distribution of stone tools. Based on stone tool data, selective conditions likely varied between the Top of Mesa 12 and Bottom. Variability in stone tool types and debitage size was also found between hinterland and riverine microenvironments when the Mesa sites are compared against 45DO673.

Technological traits of lithic debitage and tools were found to vary significantly across multiple dimensions at Mesas 06, 12, and 36, indicating that the Mesa sites do not represent a data set which can be uniformly applied to research problems, as is done in Harrod and Tyler (2016) and Reid (2014). The results of the current study, while expanding on Smith's (1977) initial work, reflect a similar conclusion to Smith (1977); the Mesa sites were likely used for multiple functions. The lithic expectations developed from the Sanpoil-Nespelem and Dunnell and Dancey (1983) models did not uniformly apply to relationships between the Mesa sites or between 45DO673 and the Mesa sites. Stone tools at Mesa 12, Mesa 36, and Mesa 06 are more diverse than 45DO673, thus not matching lithic based expectations developed in this thesis for the Sanpoil-Nespelem and Dunnell and Dancey (1983) models where riverine microenvironments typically have more diverse lithic assemblages. Debitage size and flake completeness occurred in significantly different distributions among all sites. Some of these relationships between sites conformed to the Dunnell and Dancey (1983) model expectations discussed above, while none conformed to the Sanpoil-Nespelem model expectations.

As has been discussed by previous authors, the Sanpoil-Nespelem model is not a perfect fit for any sites on the mid- Columbia Plateau (Galm et al. 1981:97-100; Norman 1996:60-61; Smith 1977:76-82). One of the issues with the comparisons made here with 45DO674 is that Root et al. (2016) defines it as an occupation site based on the diversity of the artifact assemblage and not the presence of house pit features, which are often synonymous with a riverine village site type. If 45DO673 is instead a "work camp" (e.g., fishing) as defined in Smith (1977:13), then the results of comparisons to the Mesa sites would indicate that their lithic assemblage is technologically and functionally different

from work camps as well as base camps. This would raise questions regarding the technological and functional independence of a Mesa site lithic assemblage and be resolved through further comparison to additional site types in the riverine corridor with a more specific lithic attribute analysis than applied in this thesis.

Sample sizes did not likely mask variation in this analysis, all data sets met a Rank 1 sampling curve, indicating representativeness except for size class and stone tool data at Mesa 36, and stone tool data from 45DO673 which have a Rank 3 curves. The entire excavated lithic assemblage from all three Mesa sites was analyzed. However, due to high sample sizes, Cramer's V tests indicated significant but weak correlations for all chi-square tests.

Mesa Site Function

Given the evidence presented above, it is unlikely that the Mesa sites were used for a single activity. They clearly existed as multifunctional sites within the hinterland environment as suggested by previous authors (Kuntz 2009; Galm 2006; Smith 1977:76-82). No archaeological evidence has been presented to indicate that the Mesa sites examined by Smith (1977), or the others examined on the central Columbia Plateau (Galm 2006; Kuntz 2009), were used for mono functional occupations. Testing for a defensive lithic assemblage was not the goal of this study.

Past and future studies using the Mesa site assemblages, especially those examined in this study to support defense or fortification narratives on the Columbia Plateau should treat the Mesa lithic assemblages as unique to each individual Mesa site. Based on the artifact level analysis used in this study these unique sites should be considered within the context of their microenvironments and their relationships to

regional subsistence patterns over the last two thousand years. By treating the Mesa site lithics assemblages as individual sites rather than a group, researchers will be able to better analyze the functional extent of the Mesa sites.

Future Research Directions

Based on this study, a detailed analysis of chert material quality in conjunction with heat alteration and specific interbed locations needs to be conducted to better define how technological attributes at hinterland Mesa sites are affected by raw material cost and performance. Additionally, attributes such as use wear will better differentiate technological and functional attributes on stone tools. Further comparison is also required to better explain variability in the Mesa site assemblages. Sites representing riverine short term or task specific subsistence locations may offer further insight in how Mesa sites functioned within late archaic settlement and subsistence patterns. A spatial analysis focused approach aimed at identifying additional selective conditions present within the hinterland environment, similar to Senn (2007) or Woodard (2008), would greatly increase the interpretive abilities of any future studies.

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APPENDIX A

Statistical Test Results

Appendix A

Chi-square and Resampler Results

The following appendix details the results of all Chi-square tests and Resampler bootstrapping tests completed for this project. For Chi-square results, comparisons between Mesa site and 45DO673 site size classes are shown first, followed by comparison of flake completeness between Mesa sites, and then stone tools between Mesa sites and 45DO673. The tests which are not shown in the main body text are those comparisons between individual sites for size class, flake completeness, and stone tools. Table 1 is a key for all equations and acronyms shown below

Table 1. Chi-square Acronym Key

Observed	The frequency of variables for the displayed category
Expected	The distribution of variables which are expected based on the observed frequencies of compared variables.
Fe	The frequency of expected variables
Fo-Fe	The frequency of expected observed variables

Following Chi-square test results all curves from the Resampler bootstrapping method are displayed starting with Mesa site and 45DO673 size classes, Mesa site completeness, and stone tools from all four sites. These graphs are referenced in text but only appear in this appendix.

Mesa Sites Size Class

Contingency Table

		1	2	3	4	
		1	2	3	4	
45GR144	1 Observed	16.00	331.00	3008.00	2519.00	10.2405131
	Expected	20.64	388.39	2978.29	2486.68	
	(Fo-Fe)^2	21.55	3293.49	882.96	1044.39	
	[(Fo-Fe)^2]	1.04	8.48	0.30	0.42	
45GR145	2 Observed	2.00	121.00	998.00	1049.00	35.6736825
	Expected	7.63	143.48	1100.25	918.64	
	(Fo-Fe)^2	31.65	505.37	10455.44	16993.26	
	[(Fo-Fe)^2]	4.15	3.52	9.50	18.50	
45GR162	3 Observed	36.00	564.00	3785.00	2937.00	27.2290594
	Expected	25.73	484.13	3712.46	3099.68	
	(Fo-Fe)^2	105.45	6379.11	5261.66	26463.24	
	[(Fo-Fe)^2]	4.10	13.18	1.42	8.54	
Chi-Square (χ^2)=		73.14325				

Mesas and 45DO673 Size Class

Contingency Table

		1	2	3	4	
		1	2	3	4	
45GR144	1 Observed	16.00	331.00	3008.00	2519.00	65.051
	Expected	20.69	358.81	2701.08	2793.41	
	(Fo-Fe)^2	22.04	773.26	94196.89	75302.68	
	[(Fo-Fe)^2]	1.06	2.16	34.87	26.96	
45GR145	2 Observed	2.00	121.00	998.00	1049.00	5.457
	Expected	7.64	132.55	997.85	1031.96	
	(Fo-Fe)^2	31.87	133.46	0.02	290.51	
	[(Fo-Fe)^2]	4.17	1.01	0.00	0.28	
45GR162	3 Observed	36.00	564.00	3785.00	2937.00	171.729
	Expected	25.80	447.26	3366.93	3482.02	
	(Fo-Fe)^2	104.13	13628.90	174783.00	297044.38	
	[(Fo-Fe)^2]	4.04	30.47	51.91	85.31	
45GR673	4 Observed	11	111	693	2269	841.562
	Expected	10.86504	188.3831	1418.1385	1466.6133	
	(Fo-Fe)^2	0.018214	5988.143	525825.9	643824.36	
	[(Fo-Fe)^2]	0.001676	31.78705	370.78599	438.98712	
Chi-Square (χ^2)=		1083.798				

Mesa Sites/45DO673 Size Class Individual Comparison

Contingency Table

		1	2	3	4	
		1	2	3	4	
45GR144	1 Observed	16	331	3008	2519	267.860959
	Expected	17.70462	289.8312	2426.845	3139.62	
	(Fo-Fe)^2	2.905735	1694.869	337741.6	385168.6	
	[(Fo-Fe)^2]	0.164123	5.84778	139.169	122.68	
45GR673	2 Observed	11	111	693	2269	510.186534
	Expected	9.295378	152.1688	1274.155	1648.38	
	(Fo-Fe)^2	2.905735	1694.869	337741.6	385168.6	
	[(Fo-Fe)^2]	0.3126	11.13809	265.071	233.6649	
Chi-Square (χ^2)=		778.047493				

Contingency Table

		1	2	3	4	
		1	2	3	4	
45GR162	1 Observed	36	564	3785	2937	288.510
	Expected	33.07073	474.952	3150.8664	3663.1109	
	(Fo-Fe)^2	8.580632	7929.555	402125.39	527237.04	
	[(Fo-Fe)^2]	0.259463	16.69549	127.62375	143.9315	
45GR673	2 Observed	11	111	693	2269	684.978
	Expected	13.92927	200.048	1327.1336	1542.8891	
	(Fo-Fe)^2	8.580632	7929.555	402125.39	527237.04	
	[(Fo-Fe)^2]	0.616014	39.63825	303.00295	341.72063	
Chi-Square (χ^2)=		973.488				

Contingency Table

		1	2	3	4	
		1	2	3	4	
45GR145	1 Observed	2	121	998	1049	212.614618
	Expected	5.369242	95.82033	698.4145	1370.396	
	(Fo-Fe)^2	11.35179	634.0159	89751.45	103295.3	
	[(Fo-Fe)^2]	2.114227	6.616716	128.5074	75.37626	
45GR673	2 Observed	11	111	693	2269	149.602374
	Expected	7.630758	136.1797	992.5855	1947.604	
	(Fo-Fe)^2	11.35179	634.0159	89751.45	103295.3	
	[(Fo-Fe)^2]	1.487637	4.655731	90.42188	53.03712	
Chi-Square (χ^2)=		362.216992				

Contingency Table

		1	2	3	4	
		1	2	3	4	
45GR144	1 Observed	16	331	3008	2519	17.051
	Expected	23.14701	398.3957	3023.8013	2428.656	
	(Fo-Fe)^2	51.07981	4542.184	249.68119	8162.0462	
	[(Fo-Fe)^2]	2.206756	11.40119	0.082572	3.3607256	
45GR162	2 Observed	36	564	3785	2937	13.679
	Expected	28.85299	496.6043	3769.1987	3027.344	
	(Fo-Fe)^2	51.07981	4542.184	249.68119	8162.0462	
	[(Fo-Fe)^2]	1.770348	9.146486	0.0662425	2.6961079	
Chi-Square (χ^2)=		30.730				

Mesa Sites/45DO673 Size Class Individual Comparison

Contingency Table

		1	2	3	4	
		1	2	3	4	
45GR144	1 Observed	16	331	3008	2519	5.830
	Expected	13.14421	330.0656	2925.316	2605.474	
	(Fo-Fe)^2	8.155554	0.873031	6836.601	7477.734	
	[(Fo-Fe)^2]	0.620468	0.002645	2.337047	2.870009	
45GR145	2 Observed	2	121	998	1049	15.782
	Expected	4.855793	121.9344	1080.684	962.5261	
	(Fo-Fe)^2	8.155554	0.873031	6836.601	7477.734	
	[(Fo-Fe)^2]	1.679551	0.00716	6.326181	7.768864	
Chi-Square (χ^2)=		21.612				

Contingency Table

		1	2	3	4	
		1	2	3	4	
45GR162	1 Observed	36	564	3785	2937	12.565
	Expected	29.31268	528.3997	3689.5413	3074.7463	
	(Fo-Fe)^2	44.72019	1267.381	9112.3638	18974.047	
	[(Fo-Fe)^2]	1.525626	2.398527	2.4697823	6.1709308	
45GR145	2 Observed	2	121	998	1049	42.396
	Expected	8.687316	156.6003	1093.4587	911.25369	
	(Fo-Fe)^2	44.72019	1267.381	9112.3638	18974.047	
	[(Fo-Fe)^2]	5.147757	8.093095	8.3335235	20.821915	
Chi-Square (χ^2)=		54.961				

Contingency Table

		1	2	3	4	
		One	Two	Three	Four	
12 Top	1 Observed	10	180	1020	760	54.706
	Expected	6.02	111.04	1005.40	847.53	
	(Fo-Fe)^2	15.84	4755.14	213.09	7662.34	
	[(Fo-Fe)^2]	2.63	42.82	0.21	9.04	
12 Bottom	2 Observed	8.00	152.00	1986.00	1774.00	27.493
	Expected	11.98	220.96	2000.60	1686.47	
	(Fo-Fe)^2	15.84	4755.14	213.09	7662.34	
	[(Fo-Fe)^2]	1.32	21.52	0.11	4.54	
Chi-Square (χ²)=						82.199

Mesa Sites Completeness

Contingency Table

		1	2	3	4	
		Complete	Fragment	Broken	Bebris	
45GR144	1 Observed	229.00	3703.00	1004.00	1072.00	147.956
	Expected	426.99	3650.33	1069.16	861.52	
	(Fo-Fe)^2	39198.28	2774.13	4246.18	44301.12	
	[(Fo-Fe)^2]	91.80	0.76	3.97	51.42	
45GR145	2 Observed	179.00	1396.00	384.00	299.00	5.250
	Expected	160.47	1371.91	401.83	323.79	
	(Fo-Fe)^2	343.18	580.25	317.76	614.43	
	[(Fo-Fe)^2]	2.14	0.42	0.79	1.90	
45GR162	3 Observed	723.00	4570.00	1444.00	911.00	97.022
	Expected	543.54	4646.76	1361.01	1096.69	
	(Fo-Fe)^2	32206.06	5891.84	6887.10	34481.04	
	[(Fo-Fe)^2]	59.25	1.27	5.06	31.44	
Chi-Square (χ²)=						969.668

Mesa 12 and 06 Combined vs Mesa 36 Completeness

Contingency Table

		1	2	3	4	
		Com	Frag	Broke	Debris	
12 and 06	1 Observed	952	8273	2448	1983	0.868
	Expected	970.53	8297.09	2430.17	1958.21	
	(Fo-Fe)^2	343.18	580.25	317.76	614.43	
	[(Fo-Fe)^2]	0.35	0.07	0.13	0.31	
Mesa 36	2 Observed	179.00	1396.00	384.00	299.00	5.250
	Expected	160.47	1371.91	401.83	323.79	
	(Fo-Fe)^2	343.18	580.25	317.76	614.43	
	[(Fo-Fe)^2]	2.14	0.42	0.79	1.90	
Chi-Square (χ²)=						6.118

Mesa Sites Completeness Individual Comparisons

Contingency Table

		1	2	3	4	
		Complete	Fragment	Broken	Debris	
45GR144 Top	1 Observed	97.00	1249.00	349.00	319.00	54.706
	Expected	76.77	1241.32	336.56	359.36	
	(Fo-Fe)^2	409.44	59.00	154.74	1628.57	
	[(Fo-Fe)^2]	5.33	0.05	0.46	4.53	
45GR144 Bottom	2 Observed	132.00	2454.00	655.00	753.00	27.493
	Expected	152.23	2461.68	667.44	712.64	
	(Fo-Fe)^2	409.44	59.00	154.74	1628.57	
	[(Fo-Fe)^2]	2.69	0.02	0.23	2.29	
Chi-Square (χ²)=						82.199

Contingency Table

		1	2	3	4	
		Complete	Fragment	Broken	Bebris	
45GR144	1 Observed	229.00	3703.00	1004.00	1072.00	21.134
	Expected	296.55	3706.12	1008.84	996.49	
	(Fo-Fe)^2	4562.70	9.74	23.46	5702.10	
	[(Fo-Fe)^2]	15.39	0.00	0.02	5.72	
45GR145	2 Observed	179.00	1396.00	384.00	299.00	56.233
	Expected	111.45	1392.88	379.16	374.51	
	(Fo-Fe)^2	4562.70	9.74	23.46	5702.10	
	[(Fo-Fe)^2]	40.94	0.01	0.06	15.23	
Chi-Square (χ²)=						77.367

Contingency Table

		1	2	3	4	
		Complete	Fragment	Broken	Bebris	
45GR144	1 Observed	229.00	3703.00	1004.00	1072.00	137.744
	Expected	418.84	3639.73	1077.01	872.43	
	(Fo-Fe)^2	36037.47	4002.80	5329.77	39829.36	
	[(Fo-Fe)^2]	86.04	1.10	4.95	45.65	
45GR162	2 Observed	723.00	4570.00	1444.00	911.00	108.207
	Expected	533.16	4633.27	1370.99	1110.57	
	(Fo-Fe)^2	36037.47	4002.80	5329.77	39829.36	
	[(Fo-Fe)^2]	67.59	0.86	3.89	35.86	
Chi-Square (χ²)=						245.951

Contingency Table

		1	2	3	4	
		Complete	Fragment	Broken	Bebris	
45GR145	1 Observed	179.00	1396.00	384.00	299.00	8.913
	Expected	205.60	1359.91	416.68	275.81	
	(Fo-Fe)^2	707.79	1302.78	1067.93	537.75	
	[(Fo-Fe)^2]	3.44	0.96	2.56	1.95	
45GR162	2 Observed	723.00	4570.00	1444.00	911.00	2.632
	Expected	696.40	4606.09	1411.32	934.19	
	(Fo-Fe)^2	707.79	1302.78	1067.93	537.75	
	[(Fo-Fe)^2]	1.02	0.28	0.76	0.58	
Chi-Square (χ²)=						11.545

Mesa and 45D0673 Tools

Contingency Table

		1	2	3	4	5	
		LU	LB	LP	LO	LG	
45GR144 T	1 Observed	82.00	31.00	5.00	13.00	33.00	
	Expected	83.27	41.15	16.58	9.95	13.07	
	(Fo-Fe)^2	1.61	102.95	133.99	9.33	397.39	
	[(Fo-Fe)^2]	0.02	2.50	8.08	0.94	30.42	41.96
45GR144 B	2 Observed	118.00	63.00	25.00	4.00	2.00	
	Expected	107.64	53.19	21.43	12.86	16.89	
	(Fo-Fe)^2	107.36	96.25	12.77	78.43	221.69	
	[(Fo-Fe)^2]	1.00	1.81	0.60	6.10	13.13	22.63
45GR162 (C	3 Observed	57.00	34.00	21.00	19.00	6.00	
	Expected	69.56	34.37	13.85	8.31	10.91	
	(Fo-Fe)^2	157.72	0.14	51.17	114.32	24.15	
	[(Fo-Fe)^2]	2.27	0.00	3.70	13.76	2.21	21.94
45GR145 (D	4 Observed	34.00	29.00	26.00	8.00	8.00	
	Expected	53.31	26.34	10.61	6.37	8.37	
	(Fo-Fe)^2	372.94	7.06	236.78	2.67	0.13	
	[(Fo-Fe)^2]	7.00	0.27	22.31	0.42	0.02	30.01
45DO673	5 Observed	136.00	54.00	8.00	7.00	18.00	
	Expected	113.22	55.95	22.54	13.52	17.77	
	(Fo-Fe)^2	518.77	3.80	211.37	42.55	0.05	
	[(Fo-Fe)^2]	4.581794	0.067885	9.378212	3.146593	0.00308857	17.1775728
						Chi-Square (χ²)=	133.715534

Mesa Site Tools

Contingency Table

		1	2	3	4	5	
		LU	LB	LP	LO	LG	
45GR144 T	1 Observed	82.00	31.00	5.00	13.00	33.00	
	Expected	77.22	41.66	20.43	11.68	13.00	
	(Fo-Fe)^2	22.82	113.71	238.20	1.75	399.87	
	[(Fo-Fe)^2]	0.30	2.73	11.66	0.15	30.75	45.583
45GR144 B	2 Observed	118.00	63.00	25.00	4.00	2.00	
	Expected	99.83	53.86	26.41	15.09	16.81	
	(Fo-Fe)^2	330.32	83.58	2.00	123.07	219.31	
	[(Fo-Fe)^2]	3.31	1.55	0.08	8.15	13.05	26.138
45GR162 (3 Observed	57.00	34.00	21.00	19.00	6.00	
	Expected	64.51	34.80	17.07	9.75	10.86	
	(Fo-Fe)^2	56.40	0.65	15.45	85.49	23.64	
	[(Fo-Fe)^2]	0.87	0.02	0.91	8.76	2.18	12.739
45GR145 (;	4 Observed	34.00	29.00	26.00	8.00	8.00	
	Expected	49.44	26.67	13.08	7.48	8.33	
	(Fo-Fe)^2	238.45	5.41	166.86	0.27	0.11	
	[(Fo-Fe)^2]	4.82	0.20	12.75	0.04	0.01	17.829
Chi-Square (χ2)=						102.289	

All Sites Tools Individual Comparisons

Contingency Table

		1	2	3	4	5	
		LU	LB	LP	LO	LG	
Mesa 12 To	1 Observed	82	31	5	13	33	
	Expected	92.38	36.02	5.51	8.48	21.6124031	
	(Fo-Fe)^2	107.79	25.21	0.26	20.47	129.677363	
	[(Fo-Fe)^2]	1.17	0.70	0.05	2.42	6.00013624	10.329
45DO673	2 Observed	136.00	54.00	8.00	7.00	18	
	Expected	125.62	48.98	7.49	11.52	29.3875969	
	(Fo-Fe)^2	107.79	25.21	0.26	20.47	129.677363	
	[(Fo-Fe)^2]	0.86	0.51	0.03	1.78	4.41265625	7.596
Chi-Square (χ2)=							17.926

Contingency Table

		1	2	3	4	5	
		LU	LB	LP	LO	LG	
45D0673	1 Observed	136	54	8	7	18	
	Expected	119.55	54.51	17.96	16.11	14.8666667	
	(Fo-Fe)^2	270.51	0.26	99.28	82.91	9.81777778	
	[(Fo-Fe)^2]	2.26	0.00	5.53	5.15	0.66038864	13.602
Mesa 36	2 Observed	57.00	34.00	21.00	19.00	6	
	Expected	73.45	33.49	11.04	9.89	9.13333333	
	(Fo-Fe)^2	270.51	0.26	99.28	82.91	9.81777778	
	[(Fo-Fe)^2]	3.68	0.01	9.00	8.38	1.07493917	22.141
		Chi-Square (x2)=					35.744

Contingency Table

		1	2	3	4	5	
		LU	LB	LP	LO	LG	
Mesa 06	1 Observed	34	29	36	8	8	
	Expected	47.81	24.73	16.90	8.66	16.8996416	
	(Fo-Fe)^2	190.82	18.22	364.82	0.43	79.2036202	
	[(Fo-Fe)^2]	3.99	0.74	21.59	0.05	4.68670414	31.052
45GR144 Top (12)	2 Observed	82.00	31.00	5.00	13.00	33	
	Expected	68.19	35.27	24.10	12.34	24.1003584	
	(Fo-Fe)^2	190.82	18.22	364.82	0.43	79.2036202	
	[(Fo-Fe)^2]	2.80	0.52	15.14	0.03	3.28640839	21.774
		Chi-Square (x2)=					52.826

Contingency Table

		1	2	3	4	5	
		LU	LB	LP	LO	LG	
Mesa 12	Observed	118	63	25	4	2	
	Expected	123.79	57.02	16.08	5.36	9.747126	
	(Fo-Fe)^2	33.51	35.75	79.52	1.85	60.01797	
	[(Fo-Fe)^2]	0.27	0.63	4.94	0.35	6.157504	12.345
45DO673	Observed	136.00	54.00	8.00	7.00	18	
	Expected	130.21	59.98	16.92	5.64	10.25287	
	(Fo-Fe)^2	33.51	35.75	79.52	1.85	60.01797	
	[(Fo-Fe)^2]	0.26	0.60	4.70	0.33	5.85377	11.736
		Chi-Square (χ²)=					24.081

Contingency Table

		1	2	3	4	5	
		LU	LB	LP	LO	LG	
Mesa 06	1 Observed	34	29	36	8	8	
	Expected	41.53	28.75	26.01	12.32	6.388889	
	(Fo-Fe)^2	56.67	0.06	99.76	18.67	2.595679	
	[(Fo-Fe)^2]	1.36	0.00	3.84	1.52	0.40628	7.124
Mesa 36	2 Observed	57.00	34.00	21.00	19.00	6	
	Expected	49.47	34.25	30.99	14.68	7.611111	
	(Fo-Fe)^2	56.67	0.06	99.76	18.67	2.595679	
	[(Fo-Fe)^2]	1.15	0.00	3.22	1.27	0.341038	5.980
		Chi-Square (χ2)=					13.104

Contingency Table

		1	2	3	4	5	
		LU	LB	LP	LO	LG	
Mesa 06	1 Observed	34	29	36	8	8	
	Expected	53.46	32.35	21.45	4.22	3.51682	
	(Fo-Fe)^2	378.52	11.25	211.63	14.29	20.09891	
	[(Fo-Fe)^2]	7.08	0.35	9.86	3.39	5.71508	26.394
45GR144 Bottom (12)	2 Observed	118.00	63.00	25.00	4.00	2	
	Expected	98.54	59.65	39.55	7.78	6.48318	
	(Fo-Fe)^2	378.52	11.25	211.63	14.29	20.09891	
	[(Fo-Fe)^2]	3.84	0.19	5.35	1.84	3.100162	14.318
		Chi-Square (x2)=					40.712

Contingency Table

		1	2	3	4	5	
		LU	LB	LP	LO	LG	
Mesa 36	Observed	57	34	21	19	6	
	Expected	63.27	29.58	11.83	14.56	17.7508306	
	(Fo-Fe)^2	39.26	19.49	84.02	19.67	138.082019	
	[(Fo-Fe)^2]	0.62	0.66	7.10	1.35	7.77890468	17.509
45GR144 Top (12)	Observed	82.00	31.00	5.00	13.00	33	
	Expected	75.73	35.42	14.17	17.44	21.2491694	
	(Fo-Fe)^2	39.26	19.49	84.02	19.67	138.082019	
	[(Fo-Fe)^2]	0.52	0.55	5.93	1.13	6.49823135	14.626
		Chi-Square (x2)=					32.135

Contingency Table

		1	2	3	4	5	
		LU	LB	LP	LO	LG	
Mesa 36	1 Observed	57	34	21	19	6	
	Expected	68.70	38.08	18.06	9.03	3.140401	
	(Fo-Fe)^2	136.80	16.62	8.66	99.43	8.177306	
	[(Fo-Fe)^2]	1.99	0.44	0.48	11.01	2.603905	16.524
45GR144 Bottom (12)	2 Observed	118.00	63.00	25.00	4.00	2	
	Expected	106.30	58.92	27.94	13.97	4.859599	
	(Fo-Fe)^2	136.80	16.62	8.66	99.43	8.177306	
	[(Fo-Fe)^2]	1.29	0.28	0.31	7.12	1.682712	10.678
Chi-Square (χ2)=							27.202

Contingency Table

		1	2	3	4	5	
		LU	LB	LP	LO	LG	
Mesa 06	1 Observed	34	29	36	8	8	
	Expected	41.53	28.75	26.01	12.32	6.38888889	
	(Fo-Fe)^2	56.67	0.06	99.76	18.67	2.59567901	
	[(Fo-Fe)^2]	1.36	0.00	3.84	1.52	0.40628019	7.124
Mesa 36	2 Observed	57.00	34.00	21.00	19.00	6	
	Expected	49.47	34.25	30.99	14.68	7.61111111	
	(Fo-Fe)^2	56.67	0.06	99.76	18.67	2.59567901	
	[(Fo-Fe)^2]	1.15	0.00	3.22	1.27	0.34103812	5.980
		Chi-Square (χ²)=					13.104

Contingency Table

		1	2	3	4	5	
		LU	LB	LP	LO	LG	
Mesa 06/12	Observed	234	123	66	25	43	
	Expected	227.52	122.75	68.02	34.40	38.31051	
	(Fo-Fe)^2	42.02	0.06	4.08	88.38	21.99132	
	[(Fo-Fe)^2]	0.18	0.00	0.06	2.57	0.574028	3.388
Mesa 36	Observed	57.00	34.00	21.00	19.00	6	
	Expected	63.48	34.25	18.98	9.60	10.68949	
	(Fo-Fe)^2	42.02	0.06	4.08	88.38	21.99132	
	[(Fo-Fe)^2]	0.66	0.00	0.22	9.21	2.057284	12.144
Chi-Square (χ²)=							15.533

Bootstrapping Resampler Graphs

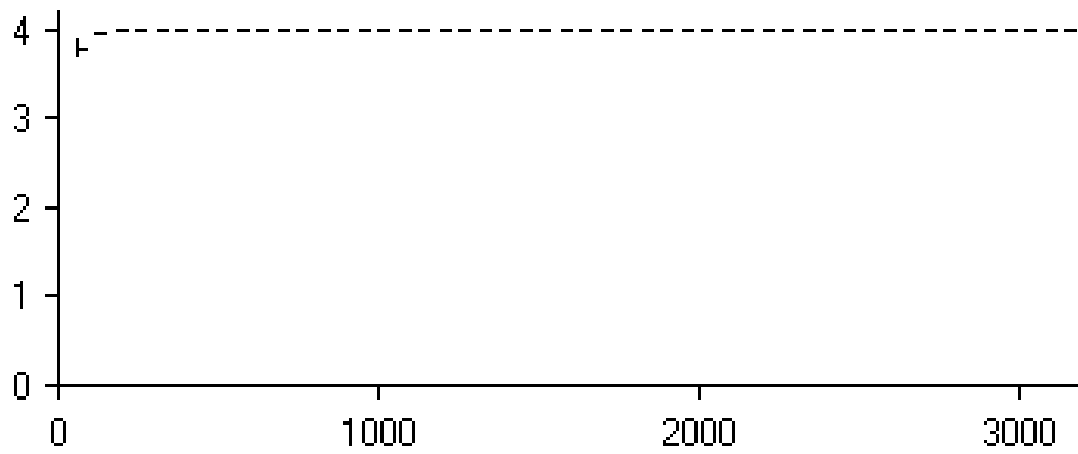


Figure 1. 45DO673 Size Class

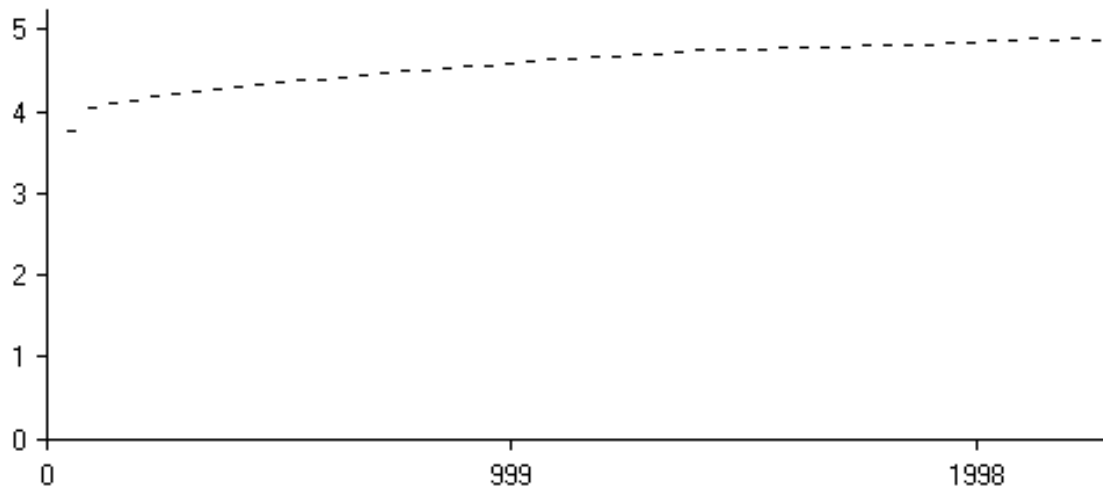


Figure 2. Mesa 36 Size Class

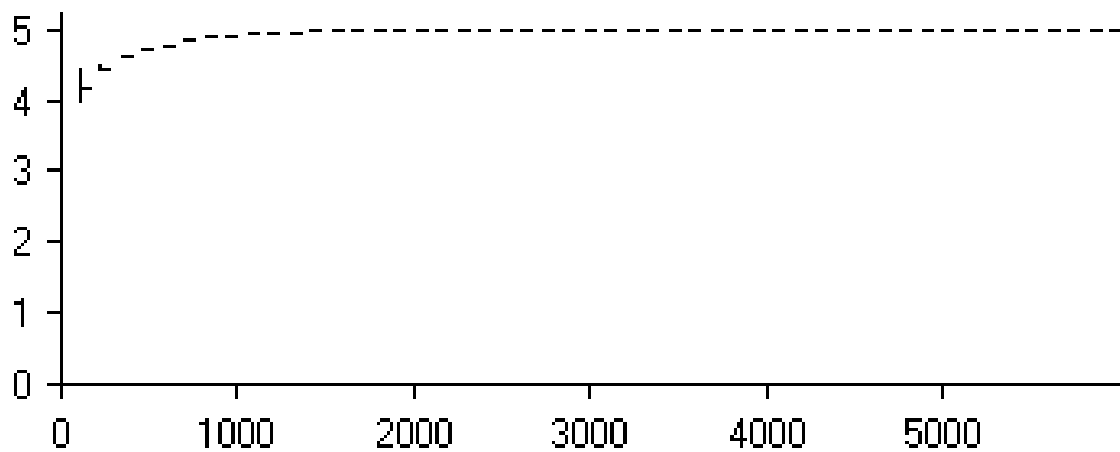


Figure 3. Mesa 12 Size Class

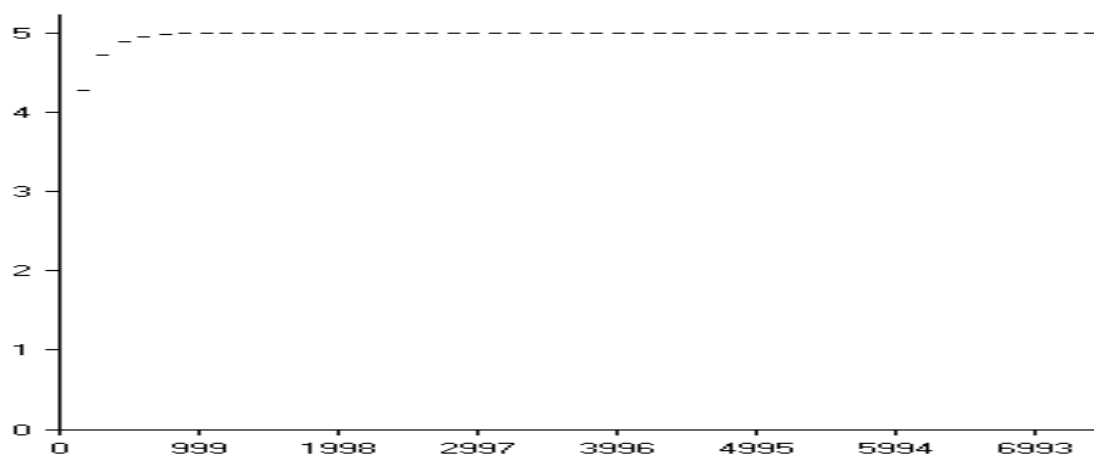


Figure 4. Mesa 06 Size Class

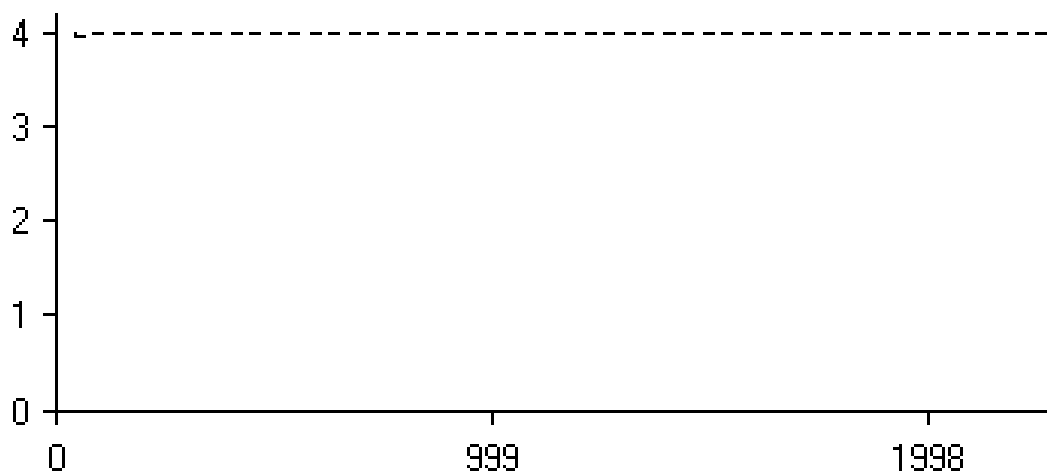


Figure 5. Mesa 36 Flake Type

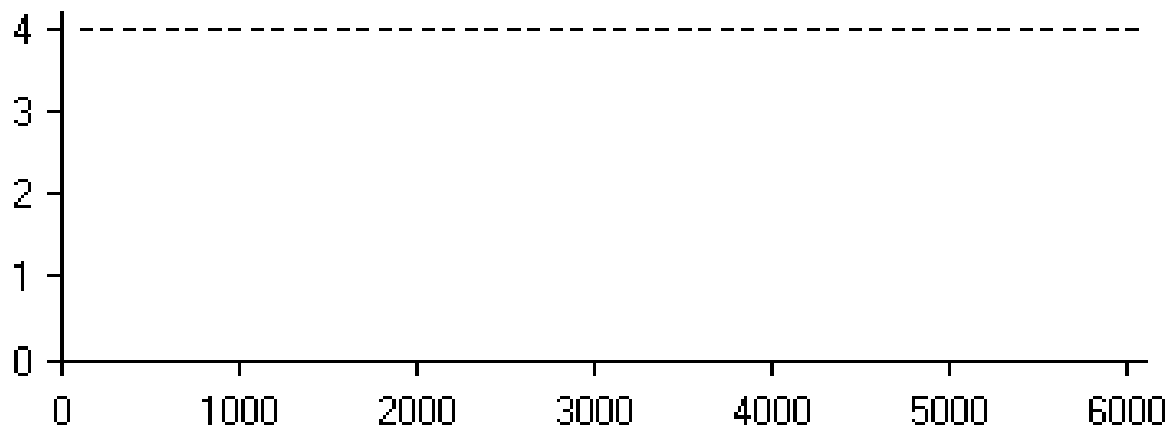


Figure 6. Mesa 12 Flake Type

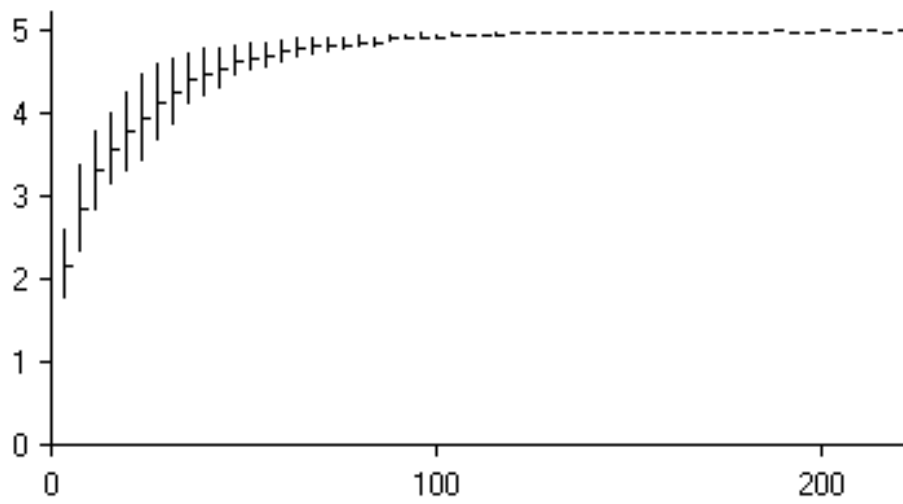


Figure 7. 45DO673 Tools

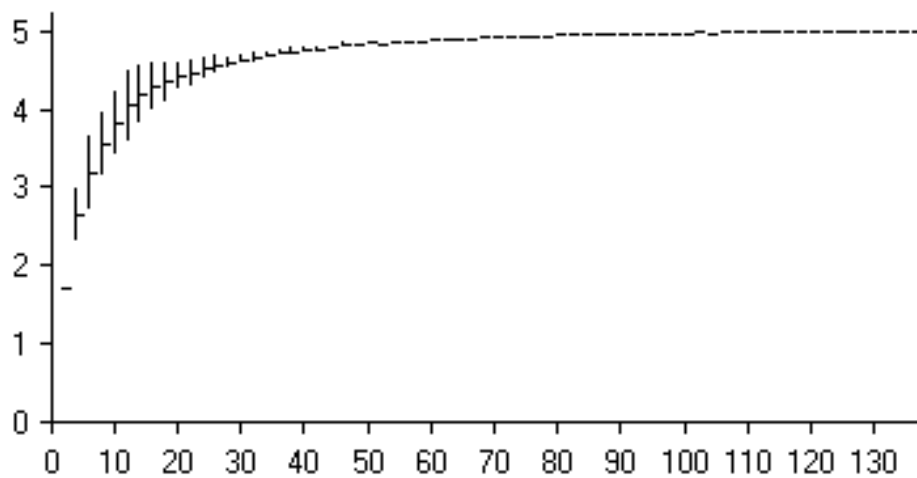


Figure 8. Mesa 36 Tools

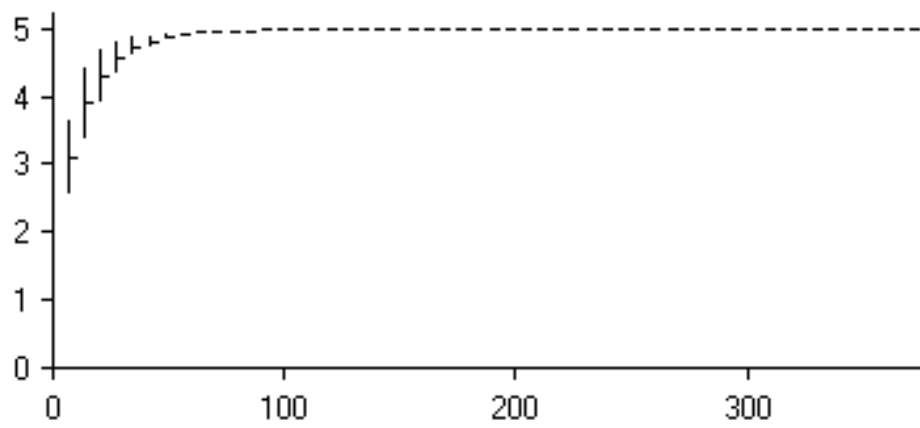


Figure 9. Mesa 12 Tools

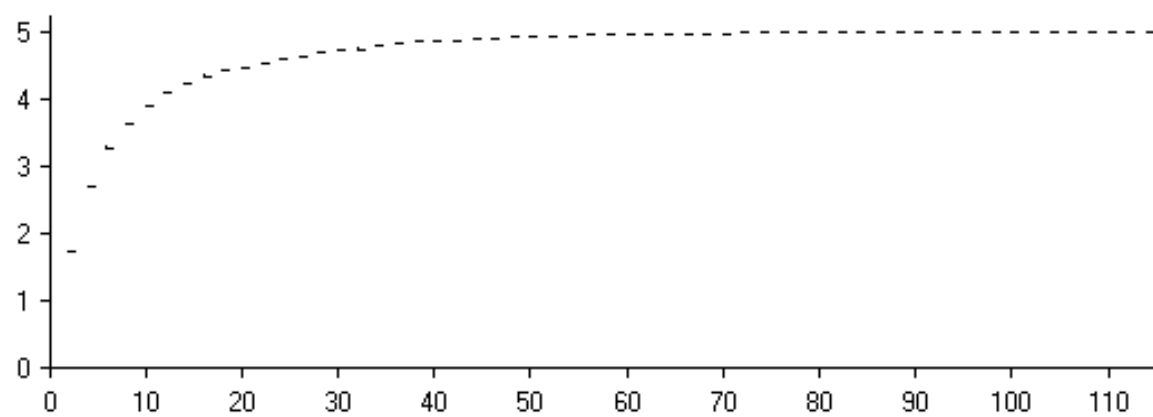


Figure 10. Mesa 06 Tools

APPENDIX B

Artifact Analysis Spreadsheets

Appendix B

Artifact Analysis Spreadsheets

The following appendix contains the Mesa site artifact analysis spreadsheets used during this study. The first set of spreadsheets detail the individual tools from each site, followed by debitage analysis, and projectile point classification data. For explanation of the Mesa site provenience system shown under the FS# column, see Smith (1977:18). For projectile point spreadsheet acronyms and calculations, see Carter (2016). Acronyms used in the following sheets are explained in Table 1.

Table 1. Artifact Analysis Spreadsheet Acronym Key

Abbreviation	Description
LU	Lithic Utilized
LB	Lithic Biface
LP	Lithic Projectile Point
LO	Lithic Core
LD	Lithic Debitage
Cat#	Catalog Number
FS#	Field Specimen number (provenience)
N	Meters North from site datum
E	Meters East from site datum

Cat#	FS#	Material	Unit	N	E	Level	Point Plot-N	Point Plot-E	Elevation-lower	Elevation-upper	Screen Size	Component	Notes	Excav date	Excavator	Count (in bag)	Old CatNo	Cataloger	Cat date
791	122612	LU	12						4.75		4	1226	Upper elevation surface; Used chunk	8/4/1973	JMH	1	456	Josh Allen	14-Jan-19
792	122612	LU	12; 150N 115E	150	115				4.75		4	1226	Upper elevation surface; Used chunk	1973	JMH	1	457	Josh Allen	14-Jan-19
793	1201	LU	0111	148.5	102				99.3		4	1201	Upper elevation surface; Used chunk	1973	DL	1	458	Josh Allen	14-Jan-19
794	1201	LU	0111	148.5	102				99.3		4	1201	Upper elevation surface; Used flake	1973	DED	1	459	Josh Allen	14-Jan-19
795	1201	LU	0111	148.5	102						4	1201	Clean-up; Used flake	1973	DL	1	460	Josh Allen	14-Jan-19
797	1201	LB	148.5N 103.5E	148.5	103.5				4.8		4	1201	Upper elevation surface; Projectile point fragment	1973	WS	1	462	Josh Allen	14-Jan-19
799	122105	LU	05						4.8		4	1221	Upper elevation surface; Used flake	1973	JMH	1	464	Josh Allen	14-Jan-19
800	122603	LU	03								4	1226	Surface to soot layer; Scraper	1973	JMH	1	465	Josh Allen	14-Jan-19
801	122603	LB	03								4	1226	Surface to soot layer; Projectile point fragment	8/4/1973	JMH	1	466	Josh Allen	14-Jan-19
803	122605	LU	05						4.59	4.75	4	1226	Used flake	8/4/1973	JMH	1	468	Josh Allen	14-Jan-19
804	122603	LU	03								4	1226	Surface to soot layer; Used flake	1973	JMH	1	469	Josh Allen	14-Jan-19
805	122603	LU	03								4	1226	Surface to soot layer; Used flake	8/4/1973	JMH	1	470	Josh Allen	14-Jan-19
806	122602	LU	02						4.75	4.8	4	1226	Screen; Used flake	1973	JMH	1	471	Josh Allen	14-Jan-19
809	1201	LP	Area 01								4	1201	Upper elevation surface; Point	8/16/1973	WCS	1	474	Josh Allen	14-Jan-19
335	1201	LB	Area 01						99.28		4	1201	Upper elevation surface; 14.21m@183.19°	1975	WS	1	1	Josh Allen	01-May-18
336	1201	LU	Area 01						99.13		4	1201	Upper elevation surface; 7.01m@205.17°	1975	WS	1	2	Josh Allen	01-May-18
337	1201	LB	Area 01						99.16		4	1201	Upper elevation surface; 8.08m@200.250°	1975	WS	1	3	Josh Allen	01-May-18
338	1201	LP	Area 01						98.93		4	1201	Upper elevation surface; 15.51m@188.20°	1975	WS	1	4	Josh Allen	01-May-18
339	1201	LB	Area 01						98.99		4	1201	Upper elevation surface; 8.40m@231.26°	1975	WS	1	5	Josh Allen	01-May-18
340	1201	LP	Area 01						99		4	1201	Upper elevation surface; 8.34m@230.28°	1975	WS	1	6	Josh Allen	01-May-18
341	1201	LB	Area 01						99.31		4	1201	Upper elevation surface; 13.99m@1.18°	1975	WS	1	7	Josh Allen	01-May-18
342	1201	LB	Area 01						99.36		4	1201	Upper elevation surface; 14.01m@10.57°	1975	WS	1	8	Josh Allen	01-May-18
343	1201	LB	Area 01						99.26		4	1201	Upper elevation surface; 17.72m@4.0°	1975	WS	1	9	Josh Allen	01-May-18
344	1201	LP	Area 01						99.29		4	1201	Upper elevation surface; 14.22m@19.06°	1975	WS	1	10	Josh Allen	01-May-18
345	1201	LB	Area 01						98.62		4	1201	Upper elevation surface; 9.45m@91.05°	1975	WS	1	11	Josh Allen	01-May-18
346	1201	LP	Area 01						99.14		4	1201	Upper elevation surface; 15.25m@27.27°	1975	WS	1	12	Josh Allen	01-May-18
348	1201	LP	Area 01						99.07		4	1201	Upper elevation surface; 15.81m@152.42°	1975	WS	1	14	Josh Allen	01-May-18
349	1201	LB	Area 01						99.16		4	1201	Upper elevation surface; 8.72m@188.09°	1975	WS	1	15	Josh Allen	01-May-18
351	1201	LP	Area 01						98.7		4	1201	Upper elevation surface; 8.97m@100.59°; Missing 2018	1975	WS	1	17	Josh Allen	01-May-17
352	1201	LP	Area 01						98.99		4	1201	Upper elevation surface; 15.57m@144.05°	1975	WS	1	18	Josh Allen	01-May-18
353	1201	LB	Area 01						99.18		4	1201	Upper elevation surface; 3.63m@26.29°	1975	WS	1	19	Josh Allen	01-May-18

354	1201	LB	Area 01						98.61		4	1201	Upper elevation surface; 18.74m@43.29°	1975	WS	1	20	Josh Allen	01-May-18
356	1201	LB	Area 01						99.32		4	1201	Upper elevation surface; 19.28m@13.41°	1975	WS	1	22	Josh Allen	01-May-18
357	1201	LB	Area 01						99.12		4	1201	Upper elevation surface; 10.13m@163°	1975	WS	1	23	Josh Allen	01-May-18
360	1201	LB	Area 01						98.31		4	1201	Upper elevation surface; 15.90m@113.13°	1975	WS	1	26	Josh Allen	05-May-18
361	1201	LP	Area 01						99.36		4	1201	Upper elevation surface; 18.79m@117.27°	1975	WS	1	27	Josh Allen	05-May-18
362	1201	LP	Area 01						99.88		4	1201	Upper elevation surface; 13.37m@191.30°	1975	WS	1	28	Josh Allen	05-May-18
363	1201	LB	Area 01						99.88		4	1201	Upper elevation surface; 15.56m@160.7°	1975	WS	1	29	Josh Allen	05-May-18
364	1201	LB	Area 01						99.26		4	1201	Upper elevation surface; 17.06m@166.45°	1975	WS	1	30	Josh Allen	05-May-18
365	1201	LU	Area 01						99.37		4	1201	Upper elevation surface; 21.04m@176.52°	1975	WS	1	31	Josh Allen	05-May-18
368	1201	LU	Area 01						99.14		4	1201	Upper elevation surface; 21.14m@212.44°	1975	WS	1	34	Josh Allen	05-May-18
370	1201	LB	Area 01						99.48		4	1201	Upper elevation surface; 25.57m@184.30°	1975	WS	1	36	Josh Allen	05-May-18
371	1201	LU	Area 01						99.42		4	1201	Upper elevation surface; 26.80m@169.14°	1975	WS	1	37	Josh Allen	05-May-18
372	1201	LB	Area 01						98.95		4	1201	Upper elevation surface; 18.27m@201.21°	1975	WS	1	38	Josh Allen	05-May-18
375	1201	LB	Area 01						99.26		4	1201	Upper elevation surface; 19.19m@167.04°	1975	JF	1	41	Josh Allen	05-May-18
376	1201	LB	Area 01						99.28		4	1201	Upper elevation surface; 15.17m@195.20°	JF	JF	1	42	Josh Allen	05-May-18
379	1201	LP	Area 01						99.16		4	1201	Upper elevation surface; 5.66m@198.14°; Missing 10/12/2018	1975	JF	0	45	Josh Allen	12-Oct-18
380	1201	LU	Area 01						98.92		4	1201	Upper elevation surface; 16.14m@194.54	1975	JF	1	46	Josh Allen	12-Oct-18
382	1201	LU	Area 01						99.13		4	1201	Upper elevation surface; 10.34m@207.49°	1975	JF	1	48	Josh Allen	12-Oct-18
383	1201	LU	Area 01						99.14		4	1201	Upper elevation surface; 8.09m@208.08°	1975	JF	1	49	Josh Allen	12-Oct-18
384	1201	LU	Area 01						99.29		4	1201	Upper elevation surface; 28.54m@196.31°	7/13/1975	JF	1	50	Josh Allen	12-Oct-18
385	1201	LU	Area 01						99.44		4	1201	Upper elevation surface; 16.22m@195.55°	7/13/1975	JF	1	51	Josh Allen	12-Oct-18
387	1201	LU	Area 01						99.15		4	1201	Upper elevation surface; 5.32m@205.52°	7/13/1975	JF	1	53	Josh Allen	12-Oct-18
388	1201	LU	Area 01						99.18		4	1201	Upper elevation surface; 5.89m@11.27°	7/13/1975	JF	1	54	Josh Allen	12-Oct-18
389	1201	LU	Area 01						99.16		4	1201	Upper elevation surface; 4.25m@37.23°	7/13/1975	JF	1	55	Josh Allen	12-Oct-18
390	1201	LU	Area 01						99.87		4	1201	Upper elevation surface; 23.12m@189.58°	7/13/1975	JF	1	56	Josh Allen	12-Oct-18
391	1201	LU	Area 01						98.84		4	1201	Upper elevation surface; 6.05m@93.30°	7/13/1975	JF	1	57	Josh Allen	12-Oct-18
392	1201	LU	Area 01						98.12		4	1201	Upper elevation surface; 25.17m@47.21°	7/13/1975	JF	1	58	Josh Allen	12-Oct-18
393	1201	LU	Area 01				120.4	93.48	99.95		4	1201	Upper elevation surface; utilized flake	7/13/1975	JH	1	59	Josh Allen	12-Oct-18

394	1201	LU	Area 01				128.8	93.2	99.46		4	1201	Upper elevation surface; utilized flake	7/13/1975	JH	1	60	Josh Allen	12-Oct-18
395	1201	LU	Area 01				128.9	99.75	99.45		4	1201	Upper elevation surface; Modified chunk	7/13/1975	JH	1	61	Josh Allen	12-Oct-18
397	1201	LU	Area 01				120.24	94.6			4	1201	Upper elevation surface; Utilized flake	7/13/1975	JH	1	63	Josh Allen	12-Oct-18
398	1201	LU	Area 01				129.62	99.58	99.41		4	1201	Upper elevation surface; Utilized flake	7/13/1975	JH	1	64	Josh Allen	12-Oct-18
399	1201	LU	Area 01				129.02	99.93	99.41		4	1201	Upper elevation surface; Missing 10/12/2018	7/13/1975	JH	0	65	Josh Allen	12-Oct-18
400	1201	LU	Area 01				129.66	94.31	99.4		4	1201	Upper elevation surface	7/13/1975	JH	1	66	Josh Allen	12-Oct-18
402	1201	LU	Area 01				126.68	100.68	98.72		4	1201	Upper elevation surface	7/13/1975	MD	1	68	Josh Allen	12-Oct-18
403	1201	LB	Area 01				122.98	104.76	99.75		4	1201	Upper elevation surface, possible pp frag	7/13/1975	MD	1	69	Josh Allen	12-Oct-18
404	1201	LU	Area 01				128.63	96.54	99.73		4	1201	Upper elevation surface	7/13/1975	JH	1	70	Josh Allen	12-Oct-18
405	1201	LB	Area 01				126.83	104.67	99.48		4	1201	Upper elevation surface	7/13/1975	MD	1	71	Josh Allen	12-Oct-18
406	1201	LB	Area 01						98.93		4	1201	Upper elevation surface; 21.14m@212.44°	7/13/1975	JF	1	72	Josh Allen	12-Oct-18
408	1201	LU	Area 01				115.8	96.65	99.35		4	1201	Upper elevation surface; Utilized flake	7/13/1975	JH	1	74	Josh Allen	12-Oct-18
409	1201	LU	Area 01				119.52	97.3	99.3		4	1201	Upper elevation surface; Utilized flake	7/13/1975	JH	1	75	Josh Allen	12-Oct-18
410	1201	LB	Area 01				115.93	97.73	99.36		4	1201	Upper elevation surface; Possible point frag.	7/13/1975	JH	1	76	Josh Allen	12-Oct-18
411	1201	LU	Area 01				112.2	95.4	99.33		4	1201		7/13/1975	JH	1	77	Josh Allen	12-Oct-18
416	1201	LU	Area 01				107.15	111.85	99.48		4	1201	Upper elevation surface	7/13/1975	JH	1	82	Josh Allen	12-Oct-18
418	1201	LU	Area 01						98.97		4	1201	Upper elevation surface; 12.35m@219.20°	7/13/1975	JF	1	84	Josh Allen	12-Oct-18
422	1201	LU	0102	130	98		130.53	98.88	99.16		4	1201		7/13/1975	DC	1	88	Josh Allen	12-Oct-18
423	1201	LP	0102	130	98		130.13	98.33	99.16		4	1201	Missing 10/12/2018	7/13/1975	DC	0	89	Josh Allen	12-Oct-18
424	1201	LU	0102	130	98		130.36	98.36			4	1201	Spall tool	7/13/1975	DC	1	90	Josh Allen	12-Oct-18
425	1201	LU	0102	130	98		130.62	98.91			4	1201	Missing 10/12/2018	7/13/1975	DC	1	91	Josh Allen	12-Oct-18
426	1201	LU	0102	130	98		130.12	98.78	99.15		4	1201	Missing 10/12/2018	7/13/1975	DC	1	92	Josh Allen	12-Oct-18
427	1201	LU	0102	130	98		130.8	98.03			4	1201	Point base	7/13/1975	DC	1	93	Josh Allen	12-Oct-18
430	1201	LU	Area 01				131.7	101.46	99.11		4	1201	Point	7/13/1975	DC	1	96	Josh Allen	12-Oct-18
431	1201	LB	0105	136	101						4	1201		7/13/1975	RF	1	97	Josh Allen	12-Oct-18
432	1201	LU	0103	130	101		131.7	101.46	99.11		4	1201	Point	7/13/1975	DC	1	98	Josh Allen	12-Oct-18
433	1201	LB	0105	136	101				99.1	99.2	4	1201		7/13/1975	RF	1	99	Josh Allen	12-Oct-18
434	1201	LU	0105	136	101				99.1	99.2	4	1201		7/13/1975	RF	1	100	Josh Allen	12-Oct-18
435	1201	LU	Area 01						99.25		4	1201	Upper elevation surface; 94.41m@135.30°	7/13/1975	JH	1	101	Josh Allen	12-Oct-18
436	1201	LU	Area 01								4	1201	Upper elevation surface; Utilized	7/13/1975	JH	1	102	Josh Allen	12-Oct-18
437	1201	LU	Area 01				136.64	93.52	99.19		4	1201	Upper elevation surface; Mod flake	7/13/1975	JH	1	103	Josh Allen	12-Oct-18
439	1201	LU	Area 01						99.1		4	1201	101.30m@130.82°; PP Base	7/13/1975	DC	1	105	Josh Allen	12-Oct-18
440	1201	LU	Area 01						99.3		4	1201	94.68m@132.42°; Tool fragment	7/13/1975	JH	1	106	Josh Allen	15-Oct-18
441	1201	LB	0103	130	101		131	101.89	99.08		4	1201	Biface fragment	7/13/1975	DC	1	107	Josh Allen	15-Oct-18
443	1201	LU	Area 01						99.19		4	1201	Upper elevation surface; 91.75m@131.62°	7/13/1975	JH	1	109	Josh Allen	15-Oct-18
444	1201	LU	0103	130	101						4	1201	1, 4cm from surface; Worked edge	7/13/1975	DC	1	110	Josh Allen	15-Oct-18
445	1201	LB	Area 01						99.11		4	1201	92.28m@134.37°; Biface tool frag	7/13/1975	JH	1	111	Josh Allen	15-Oct-18
446	1201	LU	0105	136	101				99.1	99.2	4	1201	101.52m@136.91°	7/13/1975	RF	1	112	Josh Allen	15-Oct-18
447	1201	LU	Area 01						99.31		4	1201	Upper elevation surface; 44.91m@131.84°; Utilized flake	7/13/1975	JH	1	113	Josh Allen	15-Oct-18
448	1201	LU	Area 01						99.24		4	1201	Upper elevation surface; 93.52m@133.38°; Utilized flake	7/13/1975	JH	1	114	Josh Allen	15-Oct-18
450	1201	LU	0105	136	101				99.2		4	1201	Utilized flake	7/13/1975	RF	1	116	Josh Allen	15-Oct-18

452	1201	LU	Area 01				133.57	95.33	99.3		4	1201	Upper elevation surface; Utilized Flake	7/13/1975	JH	1	118	Josh Allen	15-Oct-18
453	1201	LU	Area 01				132.9	105.82	99.14		4	1201	Upper elevation surface; Utilized flake	7/13/1975	JH	1	119	Josh Allen	15-Oct-18
454	1201	LB	0105	136	101				99.2		4	1201	Upper elevation surface	7/13/1975	RF	1	120	Josh Allen	15-Oct-18
455	1201	LB	0105	136	101				99.2		4	1201	Upper elevation surface	7/13/1975	RF	1	121	Josh Allen	15-Oct-18
456	1201	LU	Area 01				133.75	95.69	99.35		4	1201	Upper elevation surface	7/13/1975	JH	1	122	Josh Allen	15-Oct-18
457	1201	LU	0103	130	101		130.77	101.6	99.09		4	1201		7/13/1975	DC	1	123	Josh Allen	15-Oct-18
458	1201	LU	0102	130	98		130.59	98.11	99.06		4	1201		7/13/1975	JH	1	124	Josh Allen	15-Oct-18
459	1201	LU	Area 01				133.16	98.42	99.29		4	1201	Utilized chunk	7/13/1975	JH	1	125	Josh Allen	15-Oct-18
460	1201	LU	Area 01				114.3	106.19	99.13		4	1201	Upper elevation surface	7/13/1975	MD	1	126	Josh Allen	15-Oct-18
461	1201	LB	0105	136	101				99.2		4	1201	Upper elevation surface	7/13/1975	RF	1	127	Josh Allen	15-Oct-18
462	1201	LB	Area 01				138.6	100.45	99.21		4	1201	Upper elevation surface; Mod. Flake	7/17/1973	MD	1	128	Josh Allen	15-Oct-18
464	1201	LU	0103	130	101						4	1201	Screen N 1/4	7/13/1973	JDC	1	130	Josh Allen	16-Oct-18
466	1201	LU	Area 01				137.41	108.4	93.73		4	1201	Upper elevation surface; Utilized flake	7/17/1973	JMH	1	132	Josh Allen	16-Oct-18
467	1201	LU	Area 01				143.17	115.75	99.23		4	1201	Upper elevation surface; Scraper	7/13/1973	MD	1	133	Josh Allen	16-Oct-18
470	1201	LB	Area 01				140.74	94.9	98.9		4	1201	Biface fragment	7/17/1973	JMH	1	136	Josh Allen	16-Oct-18
471	1201	LB	Area 01				141.02	94.87	98.91		4	1201	Biface fragment	7/17/1973	JMH	1	137	Josh Allen	16-Oct-18
472	1201	LB	Area 01				140.59	93.97	98.78		4	1201	Upper elevation surface; Missing 10/16/2018	7/17/1973	JMH	0	138	Josh Allen	16-Oct-18
473	1201	LB	0103	130	101		131.21	101.79	99.06		4	1201		7/17/1973	JDC	1	139	Josh Allen	16-Oct-18
475	1201	LU	Area 01				144.95	99.73	99.22		4	1201	Upper elevation surface; Utilized flake	7/17/1973	JMH	1	141	Josh Allen	16-Oct-18
1285	122601	LB	2601						4.5	4.6	4	1226	Rock	7/31/1973	RF	1		Josh Allen	30-May-19
1320	1201	LB	145N 115E	145	115						4	1201	Upper elevation surface; heat treated	1973		1		Josh Allen	30-May-19
1348	1201	LU	145N 110E	145	110						4	1201	Pulled from Deb	1973		1		Josh Allen	21-Jun-19
1349	1201	LB	145N 110E	145	110						4	1201	Pulled from Deb	1973		1		Josh Allen	21-Jun-19
1350	1201	LU	Area 1201								4	1201	Surface, Battered Basalt Cobble	1973		1		Josh Allen	21-Jun-19
476	1201	LU	Area 01				144.15	98.03	99.23		4	1201	Upper elevation surface; Utilized flake	7/17/1973	JMH	1	142	Josh Allen	16-Oct-18
477	1201	LU	Area 01				137.02	101.84	99.45		4	1201	Upper elevation surface; Distal fragment	7/17/1973	RF	1	143	Josh Allen	16-Oct-18
478	1201	LB	Area 01				142.18	98.43	99.22		4	1201	Upper elevation surface; Uniface fragment	7/17/1973	JMH	1	144	Josh Allen	16-Oct-18
479	1201	LB	Area 01				145.4	96.27	98.92		4	1201	Upper elevation surface; Biface fragment	7/17/1973	JMH	1	145	Josh Allen	16-Oct-18
480	1201	LB	Area 01				145.59	95.55	98.83		4	1201	Upper elevation surface; Biface fragment	7/17/1973	JMH	1	146	Josh Allen	16-Oct-18
482	1201	LB	Area 01				145.99	99.65	99.32		4	1201	Upper elevation surface; Modified flake	7/17/1973	JMH	1	148	Josh Allen	16-Oct-18
483	1201	LB	Area 01				148.88	111.85	98.69		4	1201	Upper elevation surface; Utilized flake	7/17/1973	MD	1	149	Josh Allen	16-Oct-18
486	1201	LU	Area 01				149.6	112.89	98.63		4	1201	Upper elevation surface; Utilized flake	7/17/1973	MD	1	152	Josh Allen	29-Oct-18
487	1201	LU	Area 01				145.48	101.2	99.28		4	1201	Upper elevation surface; Utilized flake	7/18/1973	JMH	1	153	Josh Allen	29-Oct-18
489	1201	LU	Area 01				147.75	114.59	98.46		4	1201	Upper elevation surface; Utilized flake	7/18/1973	MD	1	155	Josh Allen	29-Oct-18
490	1201	LU	Area 01				148.3	108.93	99		4	1201	Upper elevation surface; Missing 10/29/2018	1973	MD	0	156	Josh Allen	29-Oct-18
494	1201	LU	Area 01				152.05	91.24	97.33		4	1201	Upper elevation surface; Utilized flake	7/18/1973	WS	1	160	Josh Allen	29-Oct-18
495	1201	LU	Area 01						98.89		4	1201	Upper elevation surface; Missing 10/19/2018	7/18/1973	MD	0	161	Josh Allen	19-Oct-18

501	1201	LU	0101	115	98				99		4	1201	Upper elevation surface; Screen; Point	7/18/1973	DL	1	167	Josh Allen	19-Oct-18
503	1201	LB	Area 01				151.68	100.54			4	1201	Surface; Utilized flake	7/18/1973	JMH	1	169	Josh Allen	19-Oct-18
513	1201	LB	0101	115	98				99		4	1201	Upper elevation surface; Biface	7/18/1973	DL	1	179	Josh Allen	02-Nov-18
514	1201	LU	Area 01						99.42		4	1201	Upper elevation surface; Utilized flake	7/18/1973	MD	1	180	Josh Allen	02-Nov-18
515	1201	LU	Area 01						99.4		4	1201	Upper elevation surface; Utilized flake	7/18/1973	MD	1	181	Josh Allen	02-Nov-18
517	1201	LP	Area 01				131.45	101			4	1201	Surface; Point fragment	7/18/1973	JDC	1	183	Josh Allen	02-Nov-18
518	1201	LP	0104	135	109	1	135.22	109.09	98.63		4	1201	Point fragment	7/18/1973	JF	1	184	Josh Allen	02-Nov-18
519	1201	LU	0104	135	109	1	135.38	109.38	98.6		4	1201	Utilized flake	7/18/1973	JF	1	185	Josh Allen	02-Nov-18
520	1201	LP	0104	135	109	1	135.76	109.41	98.64		4	1201	Preform fragment	7/18/1973	JF	1	186	Josh Allen	02-Nov-18
521	1201	LU	0104	135	109	1	136.2	109.25	99.63		4	1201	Retouched fragment	7/18/1973	JF	1	187	Josh Allen	02-Nov-18
523	1201	LU	0103	130	101						4	1201	Screen; Scraper	7/18/1973	JF	1	189	Josh Allen	02-Nov-18
524	1201	LP	0103	130	101				99	99.09	4	1201	Screen; Point fragment	7/18/1973	JDC	1	190	Josh Allen	02-Nov-18
525	1201	LP	0101	115	98				99		4	1201	Upper elevation surface; Screen; Point fragment	7/18/1973	JDC	1	191	Josh Allen	02-Nov-18
531	1201	LU	Area 01				130.53	101.26	98.99		4	1201		7/19/1973	JDC	1	197	Josh Allen	05-Nov-18
541	1201	LG	0101	115	98				98.8	99	4	1201	Screen; Ground stone	7/19/1973	DL	1	207	Josh Allen	09-Nov-18
542	1201	LU	0101	115	98				98.8	99	4	1201	Screen; Scraping tool	7/20/1973	DL	1	208	Josh Allen	09-Nov-18
544	1201	LP	0112	148.5	103		149.46	109.93	99.29		4	1201	Point fragment	7/20/1973	DED	1	210	Josh Allen	09-Nov-18
545	1201	LB	0110	147	114		147.48	114.85	98.4	98.5	4	1201	Verticle distance 98.46; Split between two units: 147-148N 114-115E	7/13/1973	MD	1	211	Josh Allen	09-Nov-18
547	1201	LB	0110	147	114				98.45	98.5	4	1201	Split between two units: 147-148N 114-115E	7/20/1973	MD	1	213	Josh Allen	09-Nov-18
548	1201	LU	0110	147	114		147.44	114.43	98.46		4	1201	Split between two units: 147-148N 114-115E; Cortex flake	7/20/1973	MD	1	214	Josh Allen	09-Nov-18
549	1201	LU	0112	148.5	103		149.26	103.25	99.18		4	1201		7/13/1973	JDC	1	215	Josh Allen	09-Nov-18
551	1201	LB	Area 01				137.6	101.76	98.96		4	1201	Point fragment	7/20/1973	RF	1	217	Josh Allen	07-Jan-19
556	1201	LB	0101	115	98				98.6	98.9	4	1201	Screen; Point	7/20/1973	JF	1	222	Josh Allen	07-Jan-19
559	1201	LU	Area 01	135	100	2	135.32	109.06	98.54		4	1201		7/13/1973	JF	1	225	Josh Allen	07-Jan-19
566	1201	LU	0112	148.5	103		149.35	103.72	99.1	99.2	4	1201	Associated with hearth formed; Knife flake	7/13/1973	JDC	1	232	Josh Allen	07-Jan-19
569	1201	LU	0112	148.5	103				99.1	99.2	4	1201	Missing 11/2018; Screen; Charcoaled and heat modified flake	7/22/1973	JDC	0	235	Josh Allen	07-Jan-19
623	1201	LB	0114	149.5	103		149.23	103.72	99.18		4	1201	Point tip	7/28/1973	DC	1	289	Josh Allen	08-Jan-19
624	1201	LU	0114	149.5	103		149.66	103.21	99.18		4	1201	Control bulk	1973	WS	1	290	Josh Allen	08-Jan-19
626	1201	LP	0116	152.5	103		152.65	104.59			4	1201	Assicociated with stones; Earth bone	1973	JDC	1	292	Josh Allen	08-Jan-19
627	1201	LP	Area 01				149.34	103.78	99.14		4	1201	Control bulk	1973	JDC	1	293	Josh Allen	08-Jan-19
628	1201	LU	0102	130	98						4	1201		1973	DL	1	294	Josh Allen	08-Jan-19
629	1201	LB	0102	130	98		130.36	98.8	99.01		4	1201	"Point tip"	7/28/1973	DL	1	295	Josh Allen	08-Jan-19
630	1201	LB	0102	130	98						4	1201	Screen; "Biface"	7/28/1973	DL	1	296	Josh Allen	08-Jan-19
631	1201	LU	0107	142	107		142.3	107.6	98.84		4	1201	"Chopper"	7/28/1973	DED	1	297	Josh Allen	08-Jan-19
632	1201	LU	0107	142	107		142.43	107.3	98.83		4	1201	"Unused chopper"	7/28/1973	DED	1	298	Josh Allen	08-Jan-19
633	1201	LU	0107	142	107		142.3	107.18	98.82		4	1201	"Chopper"	7/28/1973	DED	1	299	Josh Allen	08-Jan-19
634	1201	LU	0114	149.5	103		149.7	103.71	99.17		4	1201	Control bulk	7/25/1973	DL	1	300	Josh Allen	08-Jan-19
635	1201	LB	0104	135	109	3			98.45	98.47	4	1201	Missing 2018; "Point"; Screen from North quad	7/25/1973	JF	1	301	Josh Allen	08-Jan-19
636	1201	LB	149.5N 103.5E	149.5	103.5	1	149.7	103.9	99.31		4	1201	"Modified biface"	7/25/1973	DL	1	302	Josh Allen	08-Jan-19
638	1201	LU	149.5N 103.5	149.5	103.5	1					4	1201	Missing 2018; Screen; "Scraper"	7/26/1973	DL	0	304	Josh Allen	08-Jan-19
639	1201	LO	149.5N 103.5E	149.5	103.5		149.55	103.15	99.16		4	1201	"Exterior hearth fill"	7/26/1973	DL	1	305	Josh Allen	08-Jan-19

641	1201	LO	149.5N 103.5E	149.5	103.5		149.16	103.11	99.18		4	1201	"Interior hearth fill" "core"	7/26/1973	DL	1	307	Josh Allen	08-Jan-19
642	1201	LB	0113	148.5	104.5				99.2	99.3	4	1201	"Screen"; Within 3cm of surface above hearth	7/26/1973	JDC	1	308	Josh Allen	08-Jan-19
644	1201	LB	0113	148.5	104.5		149.42	104.05	99.2	99.3	4	1201	Point fragment/knife	7/26/1973	JDC	1	310	Josh Allen	08-Jan-19
645	1201	LB	Area 01				155.2	104.12			4	1201	Upper elevation surface; "Preformed knife"	7/27/1973	JF	1	311	Josh Allen	08-Jan-19
646	1201	LP	Area 01				149.05	103.13	99.2		4	1201	"Hearth"; "Point fragment"	7/27/1973	JDC	1	312	Josh Allen	08-Jan-19
647	1201	LG	Area 01				142.6	105.15	99.13		4	1201	Upper elevation surface; "Ground soapstone?"	7/27/1973	JF	1	313	Josh Allen	08-Jan-19
648	1201	LU	Area 01			3	135.42	109.7	98.45		4	1201	Missing 2018; Hearth assoc.; "Basalt chopper"	7/27/1973	JF	0	314	Josh Allen	08-Jan-19
649	1201	LU	Area 01				152.83	104.61	99.15		4	1201	Hearth associated; "Chopper"	7/27/1973	JDC	1	315	Josh Allen	08-Jan-19
650	1201	LU	0107	142	107		142.12	107.55	98.79		4	1201	Missing 2018; "Utilized flake"	7/30/1973	DED	0	316	Josh Allen	08-Jan-19
655	1201	LB	0110	147	114						4	1201	Screen; "Point fragment"	7/30/1973	DL	0	321	Josh Allen	08-Jan-19
656	1233-2	LU									4	1233	See feature map	7/30/1973	WS	1	322	Josh Allen	08-Jan-19
657	1233-1	LU									4	1233	"Unmodified hunk"	7/30/1973	WS	1	323	Josh Allen	08-Jan-19
658	1201	LB	0104	135	109				98.45	98.47	4	1201	N 1/4 Sq.	7/30/1973	JF	1	324	Josh Allen	08-Jan-19
662	120102	LU	0102				0.3	0.16	4.72		4	1201		7/24/19973	JMH	1	328	Josh Allen	08-Jan-19
663	122103-1	LU	01								4	1221		7/24/1973	JMH	1	329	Josh Allen	08-Jan-19
665	122104	LU	04						5	4.9	4	1221	Screen	7/24/1973	WCS	1	331	Josh Allen	08-Jan-19
668	122601	LU	01				0.67	0.46	0.38		4	1226		7/24/1973	JF	1	334	Josh Allen	08-Jan-19
671	122601	LU	01			2			4.6	4.7	4	1226	Screen	7/24/1973	JF	1	337	Josh Allen	08-Jan-19
672	122601	LP	01						4.6	4.7	4	1226	Screen	7/24/1973	JF	1	338	Josh Allen	08-Jan-19
674	122601	LB	01						4.6	4.7	4	1226	Screen	7/24/1973	JF	1	340	Josh Allen	08-Jan-19
675	122601	LU	01						4.6	4.7	4	1226	Screen	7/24/1973	JF	1	341	Josh Allen	08-Jan-19
678	122602	LU	02				0.94	0.22	4.67		4	1226		7/24/1973	JMH	1	344	Josh Allen	08-Jan-19
679	122602	LB	02				0.97	0.78	4.68		4	1226		7/24/1973	JMH	1	345	Josh Allen	08-Jan-19
680	122602	LP	02				0.98	0.72	4.68		4	1226		7/24/1973	JMH	1	346	Josh Allen	08-Jan-19
682	122602	LU	02						4.65	4.7	4	1226	Screen	7/24/1973	JMH	1	348	Josh Allen	08-Jan-19
683	122602	LU	02						4.65	4.7	4	1226	Utilized flake	7/24/1973	JMH	1	349	Josh Allen	08-Jan-19
684	122602	LU	02						4.65	4.7	4	1226	Utilized flake	7/30/1973	JMH	1	350	Josh Allen	08-Jan-19
686	122602	LU	02						4.65	4.7	4	1226	Utilized flake	7/30/1973	JMH	1	352	Josh Allen	08-Jan-19
688	122602	LO	02						4.65	4.7	4	1226	Utilized flake	7/30/1973	JMH	1	354	Josh Allen	08-Jan-19
689	122602	LU	02						4.65	4.7	4	1226	Utilized core	7/30/1973	JMH	1	355	Josh Allen	08-Jan-19
690	122602	LB	02						4.65	4.7	4	1226	Biface; Screen	7/30/1973	JMH	1	356	Josh Allen	08-Jan-19
691	122602	LU	02						4.65	4.7	4	1226	Utilized flake	7/30/1973	JMH	1	357	Josh Allen	08-Jan-19
692	122602	LU	02						4.65	4.7	4	1226	Utilized flake	7/30/1973	JMH	1	358	Josh Allen	08-Jan-19
694	122602	LB	02						4.65	4.7	4	1226	Missing 10/29/2018	7/30/1973	JMH	0	360	Josh Allen	08-Jan-19
698	122602	LU	02						4.65	4.7	4	1226	Utilized flake	7/30/1973	JMH	1	364	Josh Allen	08-Jan-19
699	122602	LU	02						4.65	4.7	4	1226	Biface fragment	7/30/1973	JMH	1	365	Josh Allen	08-Jan-19
700	122604	LU	04						504		4	1226	Missing 10/29/2018; Upper elevation surface	1973	WS	0	366	Josh Allen	08-Jan-19
701	122604	LB	04				0.13	0.06	4.71		4	1226	Missing 10/29/2018	1973	JF	0	367	Josh Allen	08-Jan-19
706	122612	LP	12						4.75		4	1226	Upper elevation surface; Side notched projectile point	1973	WS	1	372	Josh Allen	08-Jan-19
707	122604	LP	04				0.13	0.06	4.71		4	1226	Projectile point	1973	WS	1	373	Josh Allen	08-Jan-19
708	122604	LB	04						4.6	4.7	4	1226	Screen; "Drill"	7/30/1973	TF	1	374	Josh Allen	08-Jan-19
710	122607	LB	07						4.6	4.7	4	1226	Screen; Biface flake scraper	7/30/1973	JMH	1	376	Josh Allen	08-Jan-19
711	122603	LP	03								4	1226	Projectile point	7/30/1973	JHM	1	377	Josh Allen	08-Jan-19
712	122608	LP	08				0.25	0.1	4.68		4	1226	Projectile point	7/30/1973	JMH	1	378	Josh Allen	08-Jan-19
713	122602	LP	02				0.23	0.69	4.79		4	1226	Projectile point	7/30/1973	JMH	1	379	Josh Allen	08-Jan-19
714	122608	LB	08						4.78		4	1226		7/30/1973	JMH	1	380	Josh Allen	08-Jan-19
715	122601	LU	01						4.4	4.5	4	1226	NE and SE Quads	7/30/1973	JMH	1	381	Josh Allen	08-Jan-19
716	122601	LU	01						4.5	4.6	4	1226	NW corner	7/30/1973	JMH	1	382	Josh Allen	08-Jan-19
717	122601	LB	01						4.6	4.7	4	1226	Screen; Small Projectile point	7/30/1973	RF	1	383	Josh Allen	08-Jan-19

718	122604	LB	04					4.6	4.7	4	1226	Screen; Distal fragment; Projectile point	7/30/1973	RF	1	384	Josh Allen	08-Jan-19	
719	122604	LB	04					4.7	4.8	4	1226	Screen; Distal fragment; Projectile point	7/30/1973	TF	1	385	Josh Allen	08-Jan-19	
720	122601	LU	01					4.6	4.7	4	1226	Level bag; Used flake	7/30/1973	RF	1	386	Josh Allen	08-Jan-19	
721	122601	LB	01					4.6	4.7	4	1226	Level bag; Scraper	7/30/1973	RF	1	387	Josh Allen	08-Jan-19	
723	122601	LB	01					4.6	4.7	4	1226	Level bag; Duplciate old catalog number; Scraper	7/30/1973	RF	1	388	Josh Allen	08-Jan-19	
724	122601	LU	01					4.6	4.7	4	1226	Level bag; Scraper	7/30/1973	RF	1	389	Josh Allen	08-Jan-19	
726	122601	LB	01					4.6	4.7	4	1226	Level bag	7/30/1973	RF	1	391	Josh Allen	08-Jan-19	
727	122601	LB	01					4.6	4.7	4	1226	Level bag; Basalt projectile point blank (flake edge)	7/30/1973	RF	1	392	Josh Allen	08-Jan-19	
728	122604	LO	04			3		4.7	4.8	4	1226	Screen	7/30/1973	TF	1	393	Josh Allen	08-Jan-19	
729	122604	LB	04			3		4.7	4.8	4	1226	Screen; Distal fragment projectile point	7/30/1973	TF	1	394	Josh Allen	08-Jan-19	
730	122601	LB	01			3		4.7	4.8	4	1226	Screen; Distal fragment projectile point	7/30/1973	RF	1	395	Josh Allen	08-Jan-19	
731	122601	LU	01					4.5	4.6	4	1226	Screen; Used flake	8/4/1973	RF	1	396	Josh Allen	08-Jan-19	
732	122604	LB	04					4.5	4.6	4	1226	Screen; Distal projectile point fragment	8/4/1973	TF	1	397	Josh Allen	08-Jan-19	
734	122601	LB	01					4.5	4.6	4	1226	Screen; Scraper	8/4/1973	RF	1	399	Josh Allen	08-Jan-19	
735	122604	LB	04					4.7	4.8	4	1226	Screen; Projectile point fragment	8/4/1973	TF	1	400	Josh Allen	08-Jan-19	
736	122601	LB	01					4.6	4.7	4	1226	Screen; Projectile point fragment	8/4/1973	RF	1	401	Josh Allen	08-Jan-19	
737	122601	LB	01					4.6	4.7	4	1226	Screen; Projectile point fragment	8/4/1973	RF	1	402	Josh Allen	08-Jan-19	
738	1201	LB	0105	136	101		138.06	101	98.99	99.03	4	1201	Projectile point fragment	8/4/1973	DC	1	403	Josh Allen	08-Jan-19
739	122607	LU	07	90					4.64		4	1226	East side wall; Scraper	8/4/1973	JMH	1	404	Josh Allen	08-Jan-19
740	122102	LU	02								4	1221	Use modified flake	8/4/1973	JMH	1	405	Josh Allen	08-Jan-19
741	122607	LB	07					4.78		4	1226	Upper elevation surface; Screen; Biface flake	8/4/1973	JMH	1	406	Josh Allen	08-Jan-19	
743	122607	LB	07					4.78		4	1226	Upper elevation surface; Medial projectile point fragment	8/4/1973	JMH	1	408	Josh Allen	08-Jan-19	
745	122601	LU	01					4.4	4.5	4	1226	Screen; Used chunk scraper	8/4/1973	RF	1	410	Josh Allen	09-Jan-19	
749	122602	LU	02				0.5	0.72	4.71		4	1226	Worked flake	8/4/1973	JMH	1	414	Josh Allen	09-Jan-19
750	1201	LU	149N 103E	149	103				0.25		4	1201	Biface worked edge	8/4/1973	DL	1	415	Josh Allen	09-Jan-19
751	122602	LU	02				0.58	0.94	4.76		4	1226	Uniface scraper	8/4/1973	JMH	1	416	Josh Allen	09-Jan-19
752	122603	LU	03						4.75	4.8	4	1226	Screen; Used flake	8/4/1973	JMH	1	417	Josh Allen	09-Jan-19
753	122603	LU	03						4.75	4.8	4	1226	Screen; Used flake	8/4/1973	JMH	1	418	Josh Allen	09-Jan-19
754	122605	LP	05						4.6		4	1226	Screen	8/4/19973	JMH	1	419	Josh Allen	09-Jan-19
755	122603	LU	03						4.75	4.8	4	1226	Screen	8/4/1973	JMH	1	420	Josh Allen	09-Jan-19
757	122607	LP	07						4.6	4.7	4	1226	Screen; Projectile point fragment	8/4/1973	JMH	1	422	Josh Allen	09-Jan-19
759	122607	LU	07						4.6	4.7	4	1226	Screen; Used flake	8/4/1973	JMH	1	424	Josh Allen	09-Jan-19
1225	120104	LB	04	135	109	2			98.5	98.6	4	1201	Level bag; 28/38; Pulled from #276	7/24/1973	JF	1		Josh Allen	16-May-19
920	122602	LP	02								4	1226	Projectile Point; Duplicate Cat. #363	1973		1	363	Josh Allen	23-Jan-19
921	122602	LB	02								4	1226	Duplicate Cat. #380	1973		1	380	Josh Allen	23-Jan-19
927	1201	LP	Area 01							4	1201	William's Lake - tsneeto; From base of tsneeto to surface; preformed arrowhead, 1 base, 2 odd chipped artifacts	1958	NW	1		Josh Allen	29-Jan-19	
928	1201	LP	Area 01							4	1201	William's Lake - tsneeto; From base of tsneeto to surface; preformed arrowhead, 1 base, 2 odd chipped artifacts	1958	NW	1		Josh Allen	29-Jan-19	
903	122602	LP	02				0.97	0.56	4.85		4	1226		7/28/1973	JMH	1		Josh Allen	14-Jan-19
904	122602	LB	02				0.8	0.82	4.75		4	1226		7/28/1973	JMH	1		Josh Allen	14-Jan-19

929	1201	LB	Area 01							4	1201	William's Lake - tsneeto; From base of tsneeto to surface; preformed arrowhead, 1 base, 2 odd chipped artifacts	1958	NW	1		Josh Allen	29-Jan-19
935	1201	LP	Area 01							4	1201	"William's Lake - I don't know how close to tsneeto; perhaps S. end Williams; Crude bases side notch"	1958	NW	1		Josh Allen	29-Jan-19
761	122607	LU	07					4.6	4.7	4	1226	Screen; X-mend with #756 - glued together	8/4/1973	JMH	1	426	Josh Allen	09-Jan-19
762	122607	LU	07					4.6	4.7	4	1226	Screen; Used chunk	8/4/1973	JMH	1	427	Josh Allen	09-Jan-19
763	122603	LU	03					4.65	4.7	4	1226	Screen; Used flake	8/4/1973	JMH	1	428	Josh Allen	09-Jan-19
764	122603	LB	03					4.65	4.7	4	1226	Screen; Biface fragment	8/4/1973	JMH	1	429	Josh Allen	09-Jan-19
765	122603	LU	03					4.65	4.7	4	1226	Screen; Used flake	8/4/1973	JMH	1	430	Josh Allen	09-Jan-19
766	122603	LU	03					4.65	4.7	4	1226	Screen; Biface fragment	8/4/1973	JMH	1	431	Josh Allen	09-Jan-19
767	1201	LU	147N 114E					98.4	98.5	4	1201	Screen	8/4/1973	MD	1	432	Josh Allen	09-Jan-19
770	1226	LU								4	1226	Used chunk	8/4/1973	JMH	1	435	Josh Allen	09-Jan-19
771	1226	LU								4	1226	Used chunk	8/4/1973	JMH	1	436	Josh Allen	09-Jan-19
772	1226	LU								4	1226	Used flake	8/4/1973	JMH	1	437	Josh Allen	09-Jan-19
774	1226	LB								4	1226	From extreme South end of 1226	8/4/1973	JMH	1	439	Josh Allen	09-Jan-19
775	122608	LU	08					4.77	4.87	4	1226	Used chunk	1973	WS	1	440	Josh Allen	09-Jan-19
776	122608	LU	08					4.77	4.87	4	1226	Used chunk	8/4/1973	JMH	1	441	Josh Allen	09-Jan-19
777	122608	LU	08					4.77	4.87	4	1226	Used chunk	1973	WS	1	442	Josh Allen	09-Jan-19
778	122608	LU	08					4.77	4.87	4	1226	Used flake	1973	WS	1	443	Josh Allen	09-Jan-19
779	122608	LU	08					4.77	4.87	4	1226	Used flake	1973	WS	1	444	Josh Allen	09-Jan-19
780	122608	LU	08					4.77	4.87	4	1226	Used flake	1973	WS	1	445	Josh Allen	09-Jan-19
781	122608	LB	08					4.77	4.87	4	1226	Used flake	8/4/1973	JMH	1	446	Josh Allen	09-Jan-19
783	122603	LB	03							4	1226	Knife fragment	8/4/1973	JMH	1	448	Josh Allen	09-Jan-19
785	122603	LU	03			0.34	0.18	4.84		4	1226	Used flake	1973	JMH	1	450	Josh Allen	09-Jan-19
786	1201	LU	149.5N 103.5E	149.5	103.5					4	1201	Used flake	1973	WS	1	451	Josh Allen	09-Jan-19
813	1226	LG								4	1226	Upper elevation surface; Ground stone	8/16/1973	WS	1	478	Josh Allen	14-Jan-19
814	1226	LG								4	1226	Upper elevation surface; Ground stone	8/16/1973	WS	1	479	Josh Allen	14-Jan-19
830	1201	LU	0101	115	98					4	1201		10/1/1974	WS	1	500	Josh Allen	14-Jan-19
831	1201	LU	0102	130	98					4	1201		10/1/1974	WS	1	501	Josh Allen	14-Jan-19
832	1201	LU	0103	130	101					4	1201		10/1/1974	WS	1	502	Josh Allen	14-Jan-19
833	1201	LU	0103	130	101					4	1201		10/1/1974	WS	1	503	Josh Allen	14-Jan-19
834	1201	LU	0105	136	101					4	1201		10/1/1974	WS	1	504	Josh Allen	14-Jan-19
835	1201	LU	0105	136	101					4	1201	"Core"; "Probably fire spalling"; X-mend with #836	10/1/1974	WS	1	504A	Josh Allen	14-Jan-19
836	1201	LO	0105	136	101					4	1201	"Core"; "Probably fire spalling"; X-mend with #835	10/1/1974	WS	1	504B	Josh Allen	14-Jan-19
837	1201	LU	0103	130	101					4	1201		10/1/1974	WS	1	505	Josh Allen	14-Jan-19
838	1201	LU	0103	130	101					4	1201		10/1/1974	WS	1	506	Josh Allen	14-Jan-19
839	1201	LU	0103	130	101					4	1201		10/1/1974	WS	1	507	Josh Allen	14-Jan-19
840	1201	LP	0105	136	101					4	1201		10/1/1974	WS	1	508	Josh Allen	14-Jan-19
841	1201	LU	0106	138	101					4	1201		10/1/1974	WS	1	509	Josh Allen	14-Jan-19
842	1201	LU	0106	138	101			99.1	99.2	4	1201	Modified flake	10/1/1974	WS	1	510	Josh Allen	14-Jan-19
851	1201	LU	0112	148.5	103			99.2		4	1201	Upper elevation surface; Modified flake	10/1/1974	WS	1	519	Josh Allen	14-Jan-19
852	1201	LU	0112	148.5	103			99.2		4	1201	Upper elevation surface; Modified flake	10/1/1974	WS	1	520	Josh Allen	14-Jan-19
855	1201	LU	148.5N 104E	148.5	104			99.2		4	1201	Upper elevation surface; retouch	10/1/1974	WS	1	523	Josh Allen	14-Jan-19
877	1201	LU	0115	149.5	104					4	1201	Hearth fill; "Probable base"	10/24/1974	WS	1	545	Josh Allen	14-Jan-19

880	1201	LU	0115	149.5	104				99.2		4	1201	Upper elevation surface; Modified flake	10/24/1974	WS	1	548	Josh Allen	14-Jan-19
890	1264	LO									4	1264		1974	WS	1		Josh Allen	14-Jan-19
896	1268	LU									4	1268		1974	WS	1		Josh Allen	14-Jan-19
570	1201	LU	0112	148.5	103				99.1	99.2	4	1201	Missing 11/2018; Screen; Stained stone, modified flake	7/22/1973	JDC	0	236	Josh Allen	07-Jan-19
571	1201	LU	Area 01				138.32	101.62	99.28		4	1201	Scraper	7/22/1973	RF	1	237	Josh Allen	07-Jan-19
573	1201	LP	0112	148.5	103		148.78	103.29	99.1	99.2	4	1201	Associated with hearth; Wind dust	7/22/1973	JDC	1	239	Josh Allen	07-Jan-19
574	1201	LB	Area 01				138.25	103.67	99.25		4	1201		7/13/1973	RF	1	240	Josh Allen	07-Jan-19
576	1201	LU	Area 01				138.13	101.17	99.27		4	1201		7/22/1973	RF	1	242	Josh Allen	07-Jan-19
577	1201	LU	Area 01				138.34	101.33	99.25		4	1201	Missing 11/2018; Basalt chopper	7/22/1973	RF	0	243	Josh Allen	07-Jan-19
578	1201	LU	0111	148.5	102				99.3		4	1201	Missing 2018; Screen; Utilized flake	7/22/1973	DED	0	244	Josh Allen	07-Jan-19
901	122602	LP	02						4.8		4	1226	Upper elevation sod layer	1974	WS	1		Josh Allen	14-Jan-19
902	122607	LB	07						4.75	4.8	4	1226	End of first occupation	8/3/1973	JMH	1		Josh Allen	14-Jan-19
594	1201	LB	0116	152.5	104	1					4	1201	Screen	7/23/1973	JDC	1	260	Josh Allen	07-Jan-19
596	1201	LU	0114	149.5	103	1					4	1201	Upper elevation surface; Screen	7/13/1973	DL	1	262	Josh Allen	07-Jan-19
597	1201	LU	0114	149.5	103	1					4	1201	Upper elevation surface; Screen; Point	7/13/1973	DL	1	263	Josh Allen	07-Jan-19
598	1201	LU	0116	152.5	104	1	153.28	104.82			4	1201	Upper elevation surface; Screen; Utilized	7/23/1973	DL	1	264	Josh Allen	07-Jan-19
599	1201	LU	0114	149.5	103	1					4	1201	Missing 2018; Upper elevation surface; Screen; utilized flake	7/23/1973	DL	0	265	Josh Allen	07-Jan-19
600	1201	LU	0116	152.5	104	1	152.78	104.9	99.26		4	1201	Missing 2018; Upper elevation surface; Hammerstone	7/23/1973	JDC	0	266	Josh Allen	07-Jan-19
601	1201	LU	0116	152.5	104	1	152.99	104.64	99.27		4	1201	Missing 2018; Upper elevation surface; Cobble chopper	7/23/1973	JDC	0	267	Josh Allen	07-Jan-19
602	1201	LO	0116	152.5	104	1	153.34	104.3	99.26		4	1201	Upper elevation surface; Flake tool	7/23/1973	JDC	1	268	Josh Allen	07-Jan-19
603	1201	LU	0116	152.5	104	1					4	1201	Missing 2018; Upper elevation surface; Screen; Cobble chopper	7/23/1973	JDC	0	269	Josh Allen	07-Jan-19
604	1201	LU	0116	152.5	104	1					4	1201	Upper elevation surface; Screen; Scraper	7/13/1973	JDC	1	270	Josh Allen	07-Jan-19
607	1201	LU	0116	152.5	104		152.99	104.4	99.2	99.25	4	1201	"Flaked tool"	7/13/1973	JDC	1	273	Josh Allen	07-Jan-19
609	1201	LU	0116	152.5	104				99.2	99.25	4	1201	Screen	7/23/1973	JDC	1	275	Josh Allen	07-Jan-19
610	1201	LB	0116	152.5	104				99.2	99.25	4	1201	Screen	7/23/1973	JDC	1	276	Josh Allen	07-Jan-19
611	1201	LP	0106	138	101				98.98		4	1201	Screen	7/23/1973	RF	1	277	Josh Allen	07-Jan-19
614	122101	LP	0105	136	101				99.2	99.27	4	1201		7/13/1973	WCS	1	280	Josh Allen	07-Jan-19
615	1221	LU	0105	136	101				99.2	99.27	4	1201	Level bag	1973	WS	1	281	Josh Allen	07-Jan-19
616	1221	LU	140N 90E	140	90						4	1201	Upper elevation surface; Level bag; Utilized flake	7/23/1973	WS	1	282	Josh Allen	07-Jan-19
617	1201	LU	0105	136	101				99.2	99.27	4	1201	Missing 2018; Level bag; Possible utilized flake	7/23/1973	WS	0	283	Josh Allen	07-Jan-19
618	1201	LU	137.5N 102.5E	137.5	102.5						4	1201	Missing 2018; Upper elevation surface; Point fragment	7/23/1973	WS	0	284	Josh Allen	07-Jan-19
619	1201	LU	110N 90E	110	90						4	1201	Upper elevation surface; Basalt scraper	7/23/1973	WS	1	285	Josh Allen	07-Jan-19
620	1201	LU	0105	136	101				99.2	99.27	4	1201	Level bag	1973	WS	1	286	Josh Allen	08-Jan-19
622	1201	LU	0116	152.5	104		153.13	104.4	99.16		4	1201	Hearth assoc. scraper	1973	WS	1	288	Josh Allen	08-Jan-19

Cat#	FS#	Material	Unit	N	E	Level	Point Plot-N	Point Plot-E	Elevation-lower	Elevation-upper	Screen Size	Verticle Elevation (cm)	Notes	Excav date	Excavator	Count (in bag)	Cataloger	Cat date
1	01	LU	01			Surface-East	-11	13.46	63	63	4	63	Utilized Flake	6/30/1973	JDC/JF	1	Jordan Lancaster	03-Apr-18
2	01	LB	01			Surface-East	-15	13.28	61	61	4	61	Point Tip	6/30/1973	JDC/JF	1	Jordan Lancaster	03-Apr-18
3	01	LB	01			Surface-East	-18	14.3	62	62	4	62	Point Tip	6/30/1973	JDC/JF	1	Jordan Lancaster	03-Apr-18
4	01	LP	01			Surface-East	-35	13.12	62	62	4	62	Point Tip (Missing 4/13/2018)	6/30/1973	JDC/JF	0	Jordan Lancaster	03-Apr-18
5	01	LB	01			Surface-East	-42	13.19	62	62	4	62	Worked Fragment	6/30/1973	JDC/JF	1	Jordan Lancaster	03-Apr-18
6	01	LP	01			Surface-East	-11	14.87	64	64	4	64	Worked Fragment	6/30/1973	JDC/JF	1	Jordan Lancaster	03-Apr-18
7	01	LU	01			Surface-East	-25	13.75	62	62	4	62	Point Base Fragment	6/30/1973	JDC/JF	1	Jordan Lancaster	03-Apr-18
8	01	LB	01			Surface-East	-10	14.13	63	63	4	63	Worked Flake	6/30/1973	JDC/JF	1	Jordan Lancaster	03-Apr-18
9	01	LU	01			Surface-East	-47	14.25	64	64	4	64	Worked Flake	6/30/1973	JDC/JF	1	Jordan Lancaster	03-Apr-18
13	01	LP	01			Surface-East					4		Projectile Point	6/30/1973	JDC/JF	1	Jordan Lancaster	03-Apr-18
14	01	LP	01			Surface-East					4		Projectile Point	6/30/1973	JDC/JF	1	Jordan Lancaster	03-Apr-18
16	360502	LB	02			01-East					4		Screen. Biface blade or knife	6/31/1973	DC	1	Jordan Lancaster	03-Apr-18
17	360501	LP	01			01-North			52	49	4		Screen. Corner notched Point	6/31/1973	JDC	1	Jordan Lancaster	03-Apr-18
20	360503	LU	03			01-South	-6.92	-4			4		Utilized Flake	6/31/1973	JF	1	Jordan Lancaster	03-Apr-18
22	360503	LU	03			02-South	-6.45	-24	55	55	4	55	Utilized Flake	6/31/1973	JF	1	Jordan Lancaster	03-Apr-18
24	360502	LP	02			02					4		Screen. Projectile Point	6/31/1973	DL	1	Jordan Lancaster	05-Apr-18
27	361201	LB	01			Surface-30cm			30	0	4		Screen 3w/in. Point or Knife, biface	6/31/1973	JDC	1	Jordan Lancaster	05-Apr-18
28	361301	LU	01			Surface-30cm, North Half					4		Worked Flake/Scraper	6/31/1973	DL	1	Jordan Lancaster	05-Apr-18
30	361301	LU	01			Surface-30cm					4	0	Utilized Flake (Missing 4/3/2018)	6/31/1973	DL	0	Harrison Sims	03-Apr-18
31	361301	LB	01			Surface-30cm					4	0	Dril	6/31/1973	DL	1	Harrison Sims	03-Apr-18
33	361201	LP	01			Surface-40cm	-72	24	37	37	4	37	Notched Point	6/31/1973	JDC	1	Harrison Sims	05-Apr-18

34	361201	LP	01	Surface-40cm					4	0	Screen, few centimeters from surface	6/31/1973	JDC	1	Harrison Sims	05-Apr-18
37	360504	LP	04	Surface-10cm	-7.09	-17			4	0	Projectile Point	6/31/1973	JF	1	Harrison Sims	05-Apr-18
39	361201	LB	01	40-60cm					4	0	Screen North Quad. Projectile Point Tip	6/31/1973	JDC	1	Harrison Sims	05-Apr-18
42	360504	LU	04	02					4	0	North 1/2. Worked Flake	6/31/1973	JF	1	Harrison Sims	05-Apr-18
45	361201	LU	01	40-50cm North	-15	27	46	46	4	46	Biface Edge	6/31/1973	JDC	1	Jordan Lancaster	05-Apr-18
48	361301	LB	01	40-50cm South	-6	-15	41	41	4	41	Projectile Point Tip	6/31/1973	DL	1	Jordan Lancaster	05-Apr-18
50	361201	LB	01	40-50cm North	-17.5	-12	50	50	4	50	Projectile Point Tip	6/31/1973	JDC	1	Jordan Lancaster	05-Apr-18
52	361201	LU	01	40-50cm North	-32	-22	50	50	4	50	Utilized Flake	6/31/1973	JDC	1	Jordan Lancaster	05-Apr-18
53	361301	LB	01	40-50cm South					4	0	Screen. Blade Base	6/31/1973	DL	1	Jordan Lancaster	05-Apr-18
54	361201	LP	01	40-50cm North	-20	-12	50	50	4	50	Projectile Point	6/31/1973	JDC	1	Jordan Lancaster	05-Apr-18
55	361201	LP	01	40-50cm South	-90	11	48	48	4	48	Diagnostic Point	8/5/1973	JDC	1	Jordan Lancaster	05-Apr-18
59	361201	LG	01	40-50cm	66	30	45	45	4	45	Possible Hammer.	8/5/1973	JDC	1	Harrison Sims	05-Apr-18
61	361201	LG	01	40-50cm			50	48	4	0	Screen. Foreign Stone	8/5/1973	JDC	1	Harrison Sims	05-Apr-18
62	361201	LU	01	40-50cm			50	48	4	0	Screen. Uniface Scraper	8/5/1973	JDC	1	Harrison Sims	10-Apr-18
63	361201	LB	01	40-50cm			50	48	4	0	Screen. Projectile Point	8/5/1973	JDC	1	Harrison Sims	10-Apr-18
64	361201	LG	01	40-50cm	-170	38	50	50	4	50	Polished Foreign Stone	8/5/1973	JDC	1	Harrison Sims	10-Apr-18
65	361202	LP	02	01			10	10	4	10	Screen East 1/2 Retouched Projectile Point	8/5/1973	JF	1	Harrison Sims	10-Apr-18
66	361202	LU	02	01					4	0	Utilized Flake	8/5/1973	JF	1	Harrison Sims	10-Apr-18
67	361202	LB	02	01	0.7	140	27	27	4	27	Biface Fragment	8/5/1973	JF	1	Harrison Sims	10-Apr-18
70	361202	LB	02	01	23	121			4	28	Biface Fragment	8/5/1973	JF	1	Harrison Sims	10-Apr-18
72	361202	LP	02	01	15	1.53	27	27	4	27	Projectile Point	8/5/1973	JF	1	Jordan Lancaster	05-Apr-18

73	361202	LP	02	03					4	0	Screen West 1/2 of East 1/2. Projectile Point	8/5/1973	JF	1	Jordan Lancaster	05-Apr-18
75	361204	LU	04	Surface-20cm North	111	24	17	17	4	17	Worked Flake	8/5/1973	JF	1	Jordan Lancaster	05-Apr-18
76	361204	LP	04	Surface-20cm South	53	19	17	17	4	17	Projectile Point	8/5/1973	JF	1	Jordan Lancaster	05-Apr-18
81	361204	LB	04	Surface-20cm					4	0	Screen. Possible multi- tool	8/5/1973	JF	1	Jordan Lancaster	10-Apr-18
83	361204	LU	04	Surface-20cm					4	0	Screen, Utilized Flake	8/5/1973	JF	1	Jordan Lancaster	10-Apr-18
87	361205	LU	05	01 (0-10cm)					4	0	Screen. Utilized Flake	8/7/1973	JF	1	Jordan Lancaster	10-Apr-18
88	361205	LB	05	01 (0-10cm)					4	0	Screen. Biface Fragment	8/7/1973	JF	1	Jordan Lancaster	10-Apr-18
89	361205	LP	05	01 (0-10cm)					4	0	Screen. Projectile Point	8/7/1973	JF	1	Jordan Lancaster	10-Apr-18
91	361205	LP	05	01 (0-10cm)	22	28	33	33	4	33	Projectile Point Tip (Missing 4/10/2018)	8/7/1973	JF	0	Jordan Lancaster	10-Apr-18
92	361205	LP	05	01 (0-10cm)	45	81	28	28	4	28	Projectile Point Tip (Missing 4/10/2018)	8/7/1973	JF	0	Jordan Lancaster	10-Apr-18
95	361205	LB	05	02 (10-20cm)					4	0	Tool Fragment	8/7/1973	JF	2	Jordan Lancaster	10-Apr-18
96	361205	LG	05	02 (10-20cm)	30	30	43	43	4	43	Polished Stone	8/7/1973	JF	1	Jordan Lancaster	10-Apr-18
97	361203	LU	03	01	25	28	16	16	4	16	Utilized Chunk (Missing 4/10/2018)	8/7/1973	JMH	0	Jordan Lancaster	10-Apr-18
99	361203	LU	03	01	85	20	18	18	4	18	Retouched Flake	8/7/1973	JMH	1	Harrison Sims	10-Apr-18
100	361203	LB	03	01	63	20	79	79	4	79	Worked Chunk	8/7/1973	JMH	1	Harrison Sims	10-Apr-18
101	361203	LU	03	02	28	26	25	25	4	25	Utilized Chunk (Missing 4/10/2018)	8/7/1973	JMH	0	Harrison Sims	10-Apr-18
102	361203	LP	03	01					4	0	Screen. Projectile Point	8/7/1973	JMH	1	Harrison Sims	10-Apr-18
103	361203	LP	03	01					4	0	Screen. Projectile Point Fragment	8/7/1973	JMH	1	Harrison Sims	10-Apr-18
104	361203	LP	03	01					4	0	Screen. Projectile Point Fragment	8/7/1973	JMH	1	Harrison Sims	10-Apr-18
105	361203	LB	03	01					4	0	Screen. Biface Fragment	8/7/1973	JMH	1	Harrison Sims	10-Apr-18
106	361203	LU	03	02					4	0	Screen. Uniface	8/8/1973	JMH	1	Harrison Sims	10-Apr-18
107	361203	LU	03	02					4	0	Screen. Uniface Fragment	8/8/1973	JMH	1	Harrison Sims	10-Apr-18

110	361302	LU	02	02			20	10	4	0	Screen. Utilized Flake	8/8/1973	JF	1	Harrison Sims	10-Apr-18
111	361302	LU	02	02					4	0	Screen. Uniface Scraper	8/8/1973	JF	1	Harrison Sims	10-Apr-18
112	361201	LP	01	Surface-40cm					4	0	Projectile Point Fragment (Missing 4/10/2018)	8/8/1973	JDC	0	Harrison Sims	10-Apr-18
114	361203	LU	03	01					4	0	Level Bag. Utilized Flake	8/8/1973	JMH	1	Jordan Lancaster	10-Apr-18
119	360501	LU	01	01	55				4	0	Utilized Chunk (Missing 4/12/2018). Point Plot S 45	8/8/1973	JF	0	Jordan Lancaster	12-Apr-18
120	361202	LU	02	03 (19-25cm)					4	0	Level Bag. Utilized Flake	8/8/1973	JF	1	Jordan Lancaster	12-Apr-18
127	361206	LG	06	01	17	17	4	4	4	4	Polished Stone	8/9/1973	PB	1	Harrison Sims	12-Apr-18
128	361206	LB	06	01	11	12	3	3	4	3	Biface	8/9/1973	PB	1	Harrison Sims	12-Apr-18
132	361206	LU	06	01	11.5	8	2	2	4	2	Utilized Flake	8/9/1973	PB	1	Harrison Sims	12-Apr-18
133	361204	LP	04	02			20	15	4	0	Screen. Projectile Point	8/9/1973	JF	1	Harrison Sims	12-Apr-18
134	361204	LB	04	02			20	18	4	0	Screen. Projectile Point Tip	8/9/1973	JF	1	Harrison Sims	12-Apr-18
135	361204	LB	04	02			20	15	4	0	Screen. Projectile Point Tip	8/9/1973	JF	1	Harrison Sims	12-Apr-18
136	361204	LB	04	02			15	10	4	0	Knife Tip	8/9/1973	JF	1	Harrison Sims	12-Apr-18
137	361204	LB	04	02			15	10	4	0	Utilized Flake	8/9/1973	JF	1	Harrison Sims	12-Apr-18
140	361206	LU	06	01			15	10	4	0	Screen. Utilized Flake	8/9/1973	PB	1	Harrison Sims	12-Apr-18
142	361206	LP	06	02			14	10	4	0	Screen. Point Base	8/9/1973	PB	1	Jordan Lancaster	12-Apr-18
143	361206	LP	06	02			18	14	4	0	Screen. Point	8/9/1973	PB	1	Jordan Lancaster	12-Apr-18
144	361207	LP	07	02			18	14	4	0	Screen. Point Preform	8/9/1973	PB	1	Jordan Lancaster	12-Apr-18
145	361207	LP	07	01			10	8	4	0	West 1/2. Point.	8/9/1973	JF	1	Jordan Lancaster	12-Apr-18
146	361206	LB	06	01			10	8	4	0	Biface Fragment	8/9/1973	JF	1	Jordan Lancaster	12-Apr-18
148	361206	LU	06	03			30	20	4	0	Screen. Utilized Flake	8/9/1973	PB	1	Jordan Lancaster	12-Apr-18
150	361207	LB	07	02	30	60			4	0	Utilized Flake. Point Plot W 19	8/9/1973	JF	1	Jordan Lancaster	12-Apr-18

152	361207	LP	07		50	18		4	0	Knife Fragment. Point Plot W 15	8/9/1973	JF	1	Jordan Lancaster	17-Apr-18	
155	361202	LU	02	01			10	0	4	0	Utilized Flake	8/8/1973	JF	1	Josh Allen	12-Apr-18
158	361101	LP	01	01					4	0	Screen South 1/4. Point	8/8/1973	JDC	1	Josh Allen	12-Apr-18
160	361201	LU	01	01					4	0	Flake	8/4/1973	JDC	1	Josh Allen	12-Apr-18
165	361101	LB	01	01					4	0	Screen. Point Tip	8/2/1973	JDC	1	Josh Allen	12-Apr-18
166	361207	LB	07	03					4	0	Unidentified Tool Fragment	8/16/1973	JF	1	Josh Allen	12-Apr-18
167	3601	LP		Surface					4	0	Point Base	8/16/1973	JF	1	Josh Allen	12-Apr-18
168	3601	LU		Surface					4	0	Utilized Chunk	8/16/1973	JF	1	Josh Allen	12-Apr-18
175	3607	LB		Surface					4	0	Point Tip	8/16/1973	JF	1	Harrison Sims	12-Apr-18
176	3607	LU		Surface					4	0	Unifacially Modified Flake	8/16/1973	JF	1	Harrison Sims	12-Apr-18
180	3607	LU		Surface					4	0	Utilized Flake	8/16/1973	JF	1	Harrison Sims	12-Apr-18
181	3607	LU		Surface					4	0	Modified Flake Fragment	8/16/1973	JF	1	Harrison Sims	12-Apr-18
191	360502	LU	02	01					4	0	Modified Flake			1	Harrison Sims	17-Apr-18
211	361201	LU	01	2A					4	0	Modified Flake			1	Harrison Sims	17-Apr-18
245	361202	LU	02	02					4	0	Modified Flake			1	Harrison Sims	19-Apr-18
261	361205	LU	05	02					4	0	Modified Flake (Missing 4/19/2018)			0	Jordan Lancaster	19-Apr-18
264	361206	LO	06	02					4	0	Core (Missing 4/19/2018)			0	Jordan Lancaster	19-Apr-18
272	361207	LO	07	01					4	0	Core (Missing 4/19/2018)			1	Jordan Lancaster	19-Apr-18
287	3603	LU		Surface-5cm					4	0	Retouched	8/14/1973	JF	1	Harrison Sims	19-Apr-18
416	361201	LG	01						4	0		8/5/1973	Cole	1	Josh Allen	06-Feb-19
417	361201	LG	01						4	0	50-60cm	8/5/1973	Cole	1	Josh Allen	06-Feb-19
418	361201	LG	01	02					4	0	>57/110; 217-22 removed	8/5/1973	Cole	1	Jackey Anderson	06-Feb-19

Cat#	Excav date	FS#	Material	Unit	Feature	Level	Notes	Excavator	Count (in bag)	Cataloger	Cat Date
1	10/10/1975	60801	LO	01		Surface	>32 grams, C.C. core?	WRH	1	Michelle Kakadelis	08-Jan-18
4	10/10/1975	60801	LP	01		Surface-01	0.5 grams, base notched proj. point	WRH	1	Michelle Kakadelis	08-Jan-18
5	10/10/1975	60801	LB	01		Surface-01	>2 grams, drill	WRH	1	Michelle Kakadelis	08-Jan-18
7	10/10/1975	60801	LB	01		Surface-01	0.5 grams, projectile point	WRH	1	Michelle Kakadelis	08-Jan-18
8	10/10/1975	60801	LB	01		Surface	1 gram, pp tip	WRH	1	Michelle Kakadelis	08-Jan-18
9	10/12/1975	60801	LU	01	616 Fin	616 Fin	mod C.C. flake fragment	WRH	1	Josh Allen	10-Jan-18
10	10/12/1975	60801	LB	01	616 Fin	616 Fin	0.5 grams, pp tip	WRH	1	Josh Allen	10-Jan-18
11	10/12/1975	60801	LP	01	616 Fin	616 Fin	0.5 grams, pp tip	WRH	1	Josh Allen	10-Jan-18
13	10/12+13/1975	60801	LP	01		01-02	0.5 grams, side notched pp base frag	WRH	1	Josh Allen	10-Jan-18
14	10/12+13/1975	60801	LP	01		01-02	1 gram, pp base frag	WRH	1	Josh Allen	10-Jan-18
15	10/12+13/1975	60801	LP	01		01-02	2 grams, proj. pt. base frag	WRH	1	Jordan Lancaster	08-Jan-18
16	10/12+13/1975	60801	LO	01		01-02	>18 grams, possible C.C. core	WRH	1	Jordan Lancaster	08-Jan-18
17	10/12+13/1975	60801	LU	01		01-02	> 1 gram, modified flake (C.C.)	WRH	1	Jordan Lancaster	08-Jan-18
20	10/10/1975	60802	LP	02		Surface	1 gram, base notched pp	M.M.	1	Josh Allen	14-Jan-18
21	10/10/1975	60802	LB	02		Surface	0.5 grams, pp tip	M.M.	1	Josh Allen	14-Jan-18
22	10/10/1975	60802	LP	02		Surface	0.5 grmas, pp fragment	M.M.	1	Josh Allen	14-Jan-18
23	10/12/1975	60802	LB	02		01-02	0.5 grams, pp tip	M.M.	1	Josh Allen	14-Jan-18
25	9/10/1975	60803	LG	03		Surface-01	333 grams, modified basalt flake	P.F.	1	Jordan Lancaster	29-Jan-18
26	9/10/1975	60803	LG	03		02-03	1600 grams, possible matate	P.F.	1	Jordan Lancaster	29-Jan-18
27	10/10/1975	60804	LB	04		Surface-01	> 5 grams, drill, x-mend	N.W.	2	Josh Allen	14-Jan-18
28	10/10/1975	60804	LP	04		Surface-01	pp fragment	N.W.	1	Josh Allen	14-Jan-18
29	10/10/1975	60805	LU	05		Surface	>1 gram modified C.C. flake	D.McB	1	Josh Allen	14-Jan-18
33	10/10/1975	60805	LP	05		Surface-01	0.2 grams, side notched pp	D. McB	1	Josh Allen	14-Jan-18
34	10/12/1975	60801	LO	01	Feat 616	Feat 616	> 4 grams, possible C.C. core	WRH	1	Josh Allen	14-Jan-18
36	10/12/1975	60801	LU	01	Feat 616	Feat 616	0 grams, modified C.C. flake	WRH	1	Josh Allen	14-Jan-18
37	10/12/1975	60801	LU	01	Feat 616	Feat 616	0 grams, modified C.C. flake	WRH	1	Josh Allen	17-Jan-18
38	10/10/1975	60801	LP	01		Surface-01	0.2 grams, projectile point frag	WRH	1	Josh Allen	17-Jan-18
39	10/10/1975	60801	LU	01		Surface-01	0.4 grams, modified C.C. flake	WRH	1	Josh Allen	17-Jan-18
40	10/10/1975	60801	LU	01		Surface-01	1 gram, modified C.C. flake	WRH	1	Josh Allen	17-Jan-18
41	10/10/1975	60801	LU	01		Surface-01	0.1 grams, modified C.C. flake	WRH	1	Josh Allen	17-Jan-18
48	10/12/1975	60806	LP	06		Surface-01	0.7 grams, corner notched projectile point fragment	P.F.	1	Jordan Lancaster	22-Jan-18
49	10/12/1975	60806	LB	06		Surface-01	0 grams, projectile point tip	P.F.	1	Jordan Lancaster	22-Jan-18
50	10/12/1975	60806	LP	06		Surface-01	1 gram, projectile point base	P.F.	1	Jordan Lancaster	22-Jan-18
51	10/12/1975	60806	LU	06		Surface-01	>9 grams, C.C. core	P.F.	1	Jordan Lancaster	22-Jan-18

52	10/12/1975	60806	LP	06		01-02	1gram, proj. point fragment	P.F.	1	Jordan Lancaster	22-Jan-18
53	10/13/1975	60807	LU	07		Surface	0 grams, modified flake	P.F.	1	Jordan Lancaster	22-Jan-18
54	10/14/1975	60807	LU	07		Surface-01	4 grmas, possible knife base	P.F.	1	Jordan Lancaster	22-Jan-18
55	10/14/1975	60807	LU	07		Surface-01	0.4 grams, modified blade	P.F.	1	Jordan Lancaster	22-Jan-18
57	10/14/1975	60807	LP	07		Surface-01	0.5 grnas, corner notched projectile point fragment	P.F.	1	Michelle Kakadelis	22-Jan-18
62	10/14/1975	60808	LU	08		Surface	0.1 grams, modified flake (missing as of 1/22/18)	M.M.	0	Michelle Kakadelis	22-Jan-18
63	10/14/1975	60808	LU	08		Surface	0 grams, modified flake (missing as of 1/22/18)	M.M.	0	Michelle Kakadelis	22-Jan-18
64	10/14/1975	60808	LG	08		Surface-01	355.3 grams, angular basalt w/modification	M.M.	1	Michelle Kakadelis	22-Jan-18
65	10/14/1975	60808	LP	08		Surface-01	0.8 grams, projectile point tip	M.M.	1	Michelle Kakadelis	22-Jan-18
66	10/14/1975	60808	LU	08		Surface-01	2 grams, scraper	M.M.	1	Michelle Kakadelis	22-Jan-18
67	10/14/1975	60808	LU	08		Surface-01	2.8 grams, scraper	M.M.	1	Michelle Kakadelis	22-Jan-18
68	10/14/1975	60808	LP	08		Surface-01	1.4 grams, proj. pt. preform	M.M.	1	Michelle Kakadelis	22-Jan-18
69	10/14/1975	60808	LB	08		Surface-01	0.4 grams, proj. pt. frag.	M.M.	1	Michelle Kakadelis	22-Jan-18
70	10/14/1975	60808	LB	08		Surface-01	0.1 grams, drill tip	M.M.	1	Jordan Lancaster	22-Jan-18
71	10/14/1975	60808	LB	08		Surface- 01	0.2 grmas, drill tip	M.M.	1	Jordan Lancaster	22-Jan-18
72	10/14/1975	60808	LP	08		Surface-01	1 gram; corner notched projectile point	M.M.	1	Jordan Lancaster	22-Jan-18
73	10/16/1975	60808	LB	08	620		1 gram; drill	M.M.	1	Jordan Lancaster	22-Jan-18
74	10/14/1975	60809	LG	09		Surface-01	331.6 grams; basalt chunk with modification. Missing as of 1/22/18	W.R.H.	0	Jordan Lancaster	22-Jan-18
75	10/14/1975	60809	LP	09		Surface-01	1 gram; projectile point tip fragment	W.R.H.	1	Jordan Lancaster	22-Jan-18
76	10/14/1975	60809	LU	09		Surface-01	1.1 grams; basal fragment	W.R.H.	1	Jordan Lancaster	22-Jan-18
78	10/17/1975	60809	LG	09		01-02	785.7 grams; basalt chunk with modification	W.R.H.	1	Jordan Lancaster	22-Jan-18
80	10/14/1975	60809	LP	09	621		1 gram; projectile point fragment	W.R.H.	1	Jordan Lancaster	22-Jan-18
81	10/16/1975	60810	LB	10		Surface-01	0.2 grams; projectile point tip fragment	P.F.	1	Jordan Lancaster	22-Jan-18
82	10/16/1975	60810	LU	10		Surface-01	1 gram; modified flake	P.F.	1	Jordan Lancaster	22-Jan-18
83	10/16/1975	60810	LB	10		Surface-01	0.2 grams; modified flake	P.F.	1	Jordan Lancaster	22-Jan-18
84	10/16/1975	60810	LB	10	624 Fill	01-02	0.4 grams projectile point tip fragment	P.F.	1	Michelle Kakadelis	22-Jan-18
87	10/16/1975	60811	LB	11	625	Surface-01	8.2 grams, knife fragment	P.F.	1	Michelle Kakadelis	22-Jan-18
88	10/16/1975	60811	LP	11		Surface-01	0.2 grams, corner notched projectile point fragment	P.F.	1	Michelle Kakadelis	22-Jan-18
90	10/16/1975	60811	LU	11		Surface-01	0.9 grams	P.F.	1	Michelle Kakadelis	22-Jan-18
96	10/17/1975	60812	LB	12		Surface-01	33.5 grams, biface possible knife	P.F.	1	Michelle Kakadelis	29-Jan-18
97	10/17/1975	60812	LO	12		Surface-01	13 grams, core fragment	P.F.	1	Michelle Kakadelis	29-Jan-18

98	10/17/1975	60812	LU	12		Surface-01	5.2 grams, scraper	W.R.H.	1	Jordan Lancaster	22-Jan-18
99	10/17/1975	60812	LB	12		Surface-01	3.7 grams, biface fragment	W.R.H.	1	Jordan Lancaster	29-Jan-18
100	10/17/1975	60812	LB	12		Surface-01	0.2 grams projectile point tip	W.R.H.	1	Jordan Lancaster	22-Jan-18
101	10/17/1975	60812	LB	12		Surface-01	0.4 grams, biface fragment	W.R.H.	1	Jordan Lancaster	22-Jan-18
102	10/17/1975	60812	LG	12		Surface-01	263 grams, possible modified angular base	W.R.H.	1	Jordan Lancaster	29-Jan-18
103	10/20/1975	60813	LB	13		Surface-01	6.5 grams, biface, possible knife frag	M.M.	1	Jordan Lancaster	29-Jan-18
104	10/20/1975	60813	LP	13		Surface-01	0.4 grams, point fragment	M.M.	1	Jordan Lancaster	29-Jan-18
105	10/20/1975	60813	lb	13		Surface-01	0.2 grams, point tip	M.M.	1	Jordan Lancaster	29-Jan-18
106	10/20/1975	60813	LP	13		Surface-01	1.3 grams, point fragment	M.M.	1	Jordan Lancaster	29-Jan-18
107	10/20/1975	60813	LU	13		Surface-01	1 gram, scraper	M.M.	1	Jordan Lancaster	29-Jan-18
108	10/20/1975	60813	LP	13		01-02	1.6 grams, point fragment	M.M.	1	Jordan Lancaster	29-Jan-18
109	10/22/1975	60818	LU	18		Surface-01	2.9 grams, scraper	P.F.	1	Jordan Lancaster	29-Jan-18
110	10/22/1975	60818	LB	18		Surface-01	0.3 grams, point fragment	P.F.	1	Jordan Lancaster	29-Jan-18
111	10/22/1975	60818	LB	18		01-02	1.7 grams, drill fragment	P.F.	1	Jordan Lancaster	29-Jan-18
112	10/22/1975	60818	LU	18		01-02	0.6 grams, flake, scraper	P.F.	1	Michelle Kakadelis	29-Jan-18
113	10/20/1975	60812	LP	12		01-02	1.1 grams, projectile point, corner notch	W.R.H.	1	Michelle Kakadelis	29-Jan-18
114	10/22/1975	60820	LU	20		Surface-01	9.4 grams, flaked chunk "modified flake"	M.M.	1	Michelle Kakadelis	29-Jan-18
115	10/22/1975	60820	LB	20		01-02	0.2 grams, point tip	M.M.	1	Michelle Kakadelis	29-Jan-18
116	10/22/1975	60821	LU	21		Surface-01	7.1 grams, scraper	P.F.	1	Michelle Kakadelis	29-Jan-18
118	10/22/1975	60821	LU	21		Surface-01	3.2 grams, scraper fragments	P.F.	1	Michelle Kakadelis	29-Jan-18
119	10/22/1975	60821	LB	21		Surface-01	1.2 grams, point tip	P.F.	1	Michelle Kakadelis	29-Jan-18
120	10/22/1975	60819	LP	19		Surface-01	0.6 grams, point base "flake"	P.F.	1	Michelle Kakadelis	29-Jan-18
121	10/22/1975	60819	LP	19		Surface-01	0.5 grams, point tip fragment	P.F.	1	Michelle Kakadelis	29-Jan-18
122	10/22/1975	60823	LB	23		Surface-01	0.2 grams, point tip	P.F.	1	Michelle Kakadelis	29-Jan-18
123	10/22/1975	60823	LP	23		01-02	5.8 grams, scraper	P.F.	1	Michelle Kakadelis	29-Jan-18
124	10/22/1975	60824	LP	24		02-03	1 grams, corner notched point	P.F.	1	Michelle Kakadelis	29-Jan-18
125	10/22/1975	60826	LU	26		01-02	10.5 grams, scraper	P.F.	1	Michelle Kakadelis	29-Jan-18
126	10/22/1975	60826	LP	26		01-02	> 0.1 grams, point fragment	P.F.	1	Jordan Lancaster	29-Jan-18
127	10/22/1975	60826	LP	26		01-02	> 0.1 grams, point fragment	P.F.	1	Jordan Lancaster	29-Jan-18
128	10/22/1975	60827	LU	27		Surface-01	20.2 grams, scraper "Missing 1/29/2018"	P.F.	0	Jordan Lancaster	29-Jan-18
129	10/22/1975	60824	LU	24		Surface-01	15 grams, scraper	P.F.	1	Jordan Lancaster	29-Jan-18
130	10/22/1975	60827	LU	24		01-02	1.0 grams, possible scraper or biface knife "retouched debitage"	P.F.	1	Jordan Lancaster	29-Jan-18
131	10/22/1975	60827	LU	27		01-02	10 grams, core	P.F.	1	Jordan Lancaster	29-Jan-18
139	10/22/1975	608 Test Pit	LP	Test Pit		0-5 cm	10 meters from datum along intake line, 1 gram, corner notched point	P.F.	1	Jordan Lancaster	29-Jan-18

142	10/22/1975	60802	LO	02		Surface-01	2 grams, core "Missing 1/29/2018"	P.F.	0	Jordan Lancaster	29-Jan-18
143	10/22/1975	60802	LO	02		Surface-01	2.75 grams, core "Missing 2018"	P.F.	0	Jordan Lancaster	29-Jan-18
147	10/22/1975	60802	LB	02		Surface-01	0.7 grams, point tip	P.F.	1	Jordan Lancaster	29-Jan-18
149	10/22/1975	60803	LU	03		Surface-01	4 grams, modified flake	P.F.	1	Jordan Lancaster	29-Jan-18
150	10/22/1975	60803	LO	03		Surface-01	10 grams, modified core	P.F.	1	Jordan Lancaster	29-Jan-18
152	10/22/1975	60803	LO	03		Surface-01	2 grams, modified flake "Missing 1/29/2018"	P.F.	0	Jordan Lancaster	29-Jan-18
153	10/22/1975	60804	LO	04		Surface-01	5.7 grams, core "Missing 1/29/2018"	P.F.	0	Jordan Lancaster	29-Jan-18
155	10/22/1975	60804	LO	04		Surface-01	3.6 grams, core	N. Washington	1	Michelle Kakadelis	29-Jan-18
157	10/22/1975	60804	LO	04		Surface-01	4.7 grams, core	N. Washington	1	Michelle Kakadelis	29-Jan-18
158	10/22/1975	60804	LO	04		Surface-01	4.3 grams, core	N. Washington	1	Michelle Kakadelis	29-Jan-18
159	10/11/1975	60805	LO	05		Surface-01	25.2 grams, core	D. McBride	1	Michelle Kakadelis	29-Jan-18
160	10/11/1975	60805	LO	05		Surface-01	7 grams, modified core	D. McBride	1	Michelle Kakadelis	29-Jan-18
161	10/11/1975	60805	LU	05		Surface-01	4 grams, modified flake "Missing 1/29/2018"	D. McBride	0	Michelle Kakadelis	29-Jan-18
162	10/11/1975	60805	LU	05		Surface-01	2 grams, modified chunk "retouched flake"	D. McBride	1	Michelle Kakadelis	29-Jan-18
163	10/11/1975	60805	LU	05		Surface-01	1 gram, modified chunk "Missing 1/29/2018"	D. McBride	0	Michelle Kakadelis	29-Jan-18
164	10/11/1975	60804	LU	04		01-02	9.5 grams, core	N. Washington	1	Michelle Kakadelis	29-Jan-18
165	10/11/1975	60807	LU	07		Surface-01	5 grams, unfinished scraper	N. Washington	1	Michelle Kakadelis	29-Jan-18
166	10/11/1975	60807	LU	07		Surface-01	2.5 grams, modified flake	N. Washington	1	Michelle Kakadelis	29-Jan-18

167	10/11/1975	60807	LU	07		Surface-01	3 gram, modified "modified flake"	N. Washington	1	Michelle Kakadelis	29-Jan-18
169	10/11/1975	60808	LU	08		Surface-01	7.5 grams, modified chunk	N. Washington	1	Josh Allen	29-Jan-18
170	10/11/1975	60808	LU	08		Surface-01	7.5 grams, modified chunk	N. Washington	1	Josh Allen	29-Jan-18
171	10/11/1975	60808	LU	08		Surface-01	6 grams, modified chunk	N. Washington	1	Michelle Kakadelis	29-Jan-18
172	10/11/1975	60808	LU	08		Surface-01	1.5 grams, point fragment "retouched flake"	N. Washington	1	Michelle Kakadelis	29-Jan-18
173	10/11/1975	60808	LU	08		Surface-01	0.75 grams, modified flake "Missing 1/29/2018"	N. Washington	0	Michelle Kakadelis	29-Jan-18
174	10/11/1975	60808	LB	08		Surface-01	0.5 grams modified flake	N. Washington	1	Michelle Kakadelis	29-Jan-18
176	10/11/1975	60808	LU	08		Surface-01	0.25 grams modified flake "Missing 1/29/2018"	N. Washington	0	Michelle Kakadelis	29-Jan-18
181	10/11/1975	60809	LU	09		Surface-01	0.25 grams, modified flake	N. Washington	1	Michelle Kakadelis	29-Jan-18
182	10/11/1975	60809	LU	09		Surface-01	1 gram, possible scraper	N. Washington	1	Jordan Lancaster	29-Jan-18
183	10/11/1975	60809	LB	09		Surface-01	9 grams, tag says "Knife fragment" biface	N. Washington	1	Jordan Lancaster	29-Jan-18
184	10/10/1975	60802	LU	02		Surface-01	1.5 grams, scraper fragment	N. Washington	1	Jordan Lancaster	29-Jan-18
185	10/10/1975	60813	LP	13		01-02	0.2 grams, point fragment (tip)	M.M.	1	Jordan Lancaster	29-Jan-18
186	10/10/1975	60814	LO	14		Surface-01	15.1 grams, core	M.M.	1	Jordan Lancaster	29-Jan-18

187	10/20/1975	60819	LP	19		Surface-01	0.2 grams, possible point fragment, biface	M.M.	1	Jordan Lancaster	29-Jan-18
188	10/20/1975	60819	LP	19		Surface-01	0.1 grams, point fragment	M.M.	1	Jordan Lancaster	29-Jan-18
190	10/24/1975	60824	LU	24		01-02	29 gram, knife uniface	P.F.	1	Jordan Lancaster	29-Jan-18
191	10/24/1975	60828	LU	28		Surface	4 grams, scraper	W.R.H.	1	Jordan Lancaster	29-Jan-18
209	10/11/1975	6080401	LU	04		01	Uniface, separated from catalog number 208	N. Washington	1	Jordan Lancaster	05-Feb-18
234	10/16/1975	6080801	LU	08		01	Seperated from 231	M.M.	1	Jordan Lancaster	05-Feb-18
285	10/22/1975	6081901	LO	19		01	Core	W.H.	1	Michelle Kakadelis	26-Feb-18
402	10/13/1975	60808	LB	08		surf	pulled from #229, possiby obsidian	M.M.	1	Jackey Anderson	08-Jan-19
403	10/17/1975	6080802	LB	08		02	Biface	M.M.	1	Josh Allen	09-Jan-18
404	10/12/1975	6080101	LU	01		01	Utilized	W.R.H.	1	Josh Allen	22-Jan-19
406	10/23/1975	6082301	LO	23		01	Core	W.R.H.	1	Josh Allen	23-Jan-19

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	Shouldered?	Notching	ML	HL	MBW	MSL	MW	NW	TH	MBW/MW	MBW/NW	HL/ML	Type		Cat #s	Fragmented
145	yes	corner			unm								columbia corner B	Visuak		4
167													out of key			6
133	yes	corner			7.4	8.6		7.41			1.0		columbia corner B			33
104													out of key			34
102	yes	corner			6.76	6.2		5.48			1.2		columbia corner B			91
89	yes	corner			5.2	9		5.1			1.0		out of key			92
76	yes	side			5.6		15.6			0.4			Plateau Side Notched			103
73													columbia corner B	Visual		112
72													columbia corner B	Visual		142
65													out of key			143
54	no	no											out of key			144
37	yes	yes											columbia corner B	Visual		158
24	stemmed				7.1			5.7			1.2		columbia stemmed			167
17													out of key			7
14													columbia corner B	Visual		55
13													columbia stemmed	Visual		

keyed	16
columbia B	7
columbia stem	2
plateau side	1
out of key	6